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PRODUCTION OF SUGAR IN THE UNITED STATES AND FOREIGN COUNTRIES.

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The ton used in this bulletin is the short ton of 2,000 pounds.

INTRODUCTION.

The data presented in this bulletin cover the period from September 1, 1903, when the Brussels Convention went into effect, to the close of the sugar year 1912–13, with a comparison of the preceding decade.

These two decades exhibit considerable improvement and economic changes in the sugar industry. Prior to the adoption of the Brussels

NOTE.—This bulletin is a concise account of the sugar production of the United States and of practically all foreign countries. It is intended for general circulation.

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Convention the beet-sugar industry of Europe had been aided by direct and indirect bounties from the different Governments, which served as a great incentive to the industry. The output of sugar was in excess of domestic requirements and a large quantity had to be marketed abroad. In many instances the sugar was sold in foreign countries at a price less than the domestic price in the country of production. The production of beet sugar had risen to an equal with and in some years had exceeded the production of cane sugar.

Efforts to abolish sugar bounties began as early as 1878, but encountered strong opposition. In December, 1901, the delegates appointed by the different sugar-producing countries of Europe met at Brussels, Belgium, to draft articles of agreement to abolish both direct and indirect sugar bounties. These agreements were adopted and signed on the 5th of March, 1902, and became effective on September 1, 1903. The adhering countries were the United Kingdom, Germany, Austria-Hungary, Belgium, Spain, France, Italy, the Netherlands, and Sweden. Subsequently, Russia, Switzerland, and Peru became members of the convention. The terms of the convention provided for a repeal of all bounty legislation in the countries adhering to the convention and the levying of a countervailing duty on sugar imported from countries that paid a bounty to the industry. The effects of these agreements brought about a reduction in the area planted to beets in 1904 and a consequent decrease in production of beets and sugar. However, these conditions did not continue, for in 1905 and subsequently a general increase in area and production of beets and sugar is shown.

The total world production of both beet and cane sugar has nearly doubled during the last 20 years, increasing from 11,000,000 tons in 1893–94 to 20,000,000 tons in 1912–13. The annual world output of sugar during the decade 1903–4 to 1912–13 averaged 16,419,000 tons, as against 11,498,000 tons for the preceding decade 1893–94 to 1902–3, an increase of 37 per cent. The production of beet sugar for these two periods shows an increase from 5,839,000 tons to 7,853,000, an increase of 34 per cent, as compared with the increase in cane-sugar production from 6,110,000 tons to 8,566,000, an increase of 40 per cent. The increase in the output of cane sugar was largely due to better industrial conditions in Cuba, which resulted in the annual output of sugar being increased from 669,000 tons during the decade 1893–94 to 1902–3 to 1,687,000 tons during the following decade 1903–4 to 1912–13, an increase of 152 per cent. The increase in the output of sugar in Java was also a large factor. The annual production of sugar in that island was 722,000 tons and 1,333,000 tons, respectively, for the two decades just mentioned, or an increase of 85 per cent. The increase in the annual output of beet sugar was confined chiefly to four countries. These countries and their increases

were 487,961 tons for Russia, 371,357 for the United States, 339,839 for Austria-Hungary, and 240,044 for Germany. The annual yield of beets per acre during the decade 1903–4 to 1912–13 for the older beet-growing countries was lower, due mostly to the crop failure in 1911, than for the preceding decade, while the sugar extraction per weight of beets was higher. A very slight increase (0.2 of 1 ton) in yield of beets per acre is shown for the Netherlands and Russia, while Austria gained nearly 1 ton and Hungary more than 1 ton per acre. The decreases are nearly 1½ tons for Belgium, 1 ton for France, and three-fourths of a ton for Germany. During the decade 1903–1912, the yield of beets per acre in the United States was greater than in Hungary and Russia, but less than for the other European countries. The yield per acre during this decade was 13.89 tons for the Netherlands, 12.75 for Germany, 12.67 for Belgium, 11.25 for Austria, 11.23 for Austria-Hungary, 10.98 for France, 9.95 for the United States, 9.86 for Hungary, and 6.90 for Russia. The extraction of sugar per weight of beets was 15.31 per cent for Germany, 15.29 for Austria-Hungary, 15.26 for Belgium,[1] 14.90 for the Netherlands, 13.30 for Russia, 12.15 for the United States,[1] and 12 for France.[1] The increase in production of beet sugar per acre during the decade 1903–4 to 1912–13 over the preceding decade was 594 pounds for Austria-Hungary, 320 pounds for the United States,[1] 195 for Russia, 133 for Germany, and 80 for Netherlands. The annual production of beet sugar per acre during the last ten years was 3,908 pounds for Germany, 3,796 for Belgium,[1] 3,377 for Austria-Hungary, 2,980 for the Netherlands, 2,824 for France,[1] 2,436 for the United States,[1] and 1,849 for Russia. The yield of sugar per ton of beets also shows considerable increase, due largely to improved methods of extraction. The increase in yield of sugar per ton of beets varied from 8 pounds for France to 40 pounds for Belgium. The annual yield of sugar per ton of beets was 306 pounds for Germany, 300 for Belgium,[1] 297 for the Netherlands, 296 for Austria-Hungary, 268 for Russia, and 243 each for the United States[1] and France.[1]

The number of beet-sugar factories in each of the beet-growing countries shows a decrease since 1903, except for the United States and Russia. The decrease in number of factories was accounted for by increasing the capacity and improving the methods. Hungary, taken alone, shows an increase, but the decrease in Austria was greater than the total number of factories in Hungary. The annual output of sugar per factory during the decade ending 1912–13 was greater for Hungary than for any other country, amounting to an average of 17,610 tons, as against 5,312 tons for

[1] Refined sugar.

Austria, or 6,615 for the Empire. The average output of sugar per factory for other countries was 7,585 tons for the Netherlands, 7,474 for the United States, 6,170 for Germany, 4,947 for Russia, 3,054 for France, and 2,765 for Belgium. The percentage of increase in the output of sugar per factory during the decade 1903–4 to 1912–13 over the preceding decade was greatest for the United States, amounting to 94 per cent, as compared with 54 per cent for the Netherlands, 41 for Germany, 38 each for Austria-Hungary and Russia, and 20 per cent for Belgium.

Statistics of practically all of the beet-growing countries give the total world area used for beets in excess of 6,000,000 acres, or an average of about 1 ton of sugar per acre of beets. As the average yield of sugar per acre of cane is slightly higher than for beets, it may be assumed that another 6,000,000 acres of cane are harvested for sugar. Thus a total of 12,000,000 acres are harvested annually to produce the world's supply of sugar. In the Tropics the harvested cane is only a part, sometimes about one-half, of the total cane area. The cane growing in all countries in a normal season but not harvested might equal 3,000,000 acres, thus making the total world area of cane possibly 9,000,000 and the total area of cane and beets 15,000,000 acres. The yield of beet sugar per acre has varied from 1,800 to 3,900 pounds, while the cane sugar for countries where reliable data are available varies from 2,000 pounds per acre to more than 9,000 pounds. Hawaii and Java exceeded all other countries in production of sugar per acre harvested, amounting to 4½ tons and 5 tons for some years for Hawaii,[1] as against slightly more than 2 tons for Cuba, 1 ton each for the United States, Porto Rico, Argentina, Australia, and British India. The yield of cane per acre for Hawaii and Java was also higher than for other countries, and averaged about 40 tons, as against about 20 tons for the other countries. As far as data are available, the United States exceeds in production of beet sugar per factory employee, amounting to 59.80 tons annually for the decade 1903–4 to 1912–13, as against 22.97 for Hungary, 20.61 for France, 13.95 for Austria, 11.42 for Russia, and 19.09 for cane sugar for Hawaii.

During the decade 1903–4 to 1912–13 78.9 per cent of the world's output of sugar was produced in 11 countries, compared with 81 per cent for the preceding decade. The 11 countries and the percentage of world's sugar crop produced in each during this decade were 14.5 per cent for British India, 13.6 for Germany, 10.3 for Cuba, 8 per cent each for Austria-Hungary, Java, and Russia, 4.7 each for the United States and France, 3 for Hawaii, and 1.5 each for Belgium and the Netherlands. During this period Germany produced 28.4 per cent of the beet sugar, Austria-Hungary 18.2, Russia 17.4, France

[1] Hawaii, in 1914–15 had 239,800 acres of growing cane, and harvested 113,200 acres, or 47 per cent.

9.9, and the United States 7.3. British India produced 27.9 per cent of the cane sugar, Cuba 19.7, Java 15.6, Hawaii 5.8, and the United States 3.9.

During the decade 1904–1913 the annual exports of sugar from Cuba exceeded all other countries, amounting to 1,626,000 tons; Java, 1,342,000; Germany, 920,000; Austria-Hungary, 755,000; and Hawaii, 482,000. The cane-sugar producing countries show a large increase in exports of sugar, while the beet-sugar countries, with the exception of Russia, show either a small increase or a decrease. The United States exceeded all other countries in imports of sugar, amounting to 2,743,000 tons, as compared with 1,843,000 tons for the United Kingdom, 147,000 for France, 83,000 for the Netherlands, 35,000 for Argentina, and 13,000 for Germany.

The United States also heads the list in consumption of sugar, which amounted to an annual average of 3,492,000 tons during the 10 years 1904–1913, an increase over the preceding decade of 42.9 per cent, as against 2,633,000 for British India; 1,884,000 for the United Kingdom, an increase of 9.9 per cent; 1,203,000 for Germany, an increase of 44.3 per cent; 1,129,000 for Russia, an increase of 49.7 per cent; 662,000 for France, an increase of 37.7 per cent; and 634,174 for Austria-Hungary, an increase of 55 per cent. During the decade 1904–1913 Australia exceeded all other countries in per capita consumption of sugar, amounting to 112.96 pounds, as compared with 85 pounds for the United Kingdom, 77.6 for the United States, 60.6 for Cuba, 38 for Germany, 30.6 for France, 28.1 for Belgium, 26 for Austria-Hungary, 16.7 for British India, and 14.4 for Russia.

The adoption of the articles of agreement at the Brussels Convention brought about a change in the sugar industry of international importance. Eleven years later the outbreak of the European war brought about another change of international importance, the effects of which can not be determined until after the close of the war. The United Kingdom had been the chief market for the beet sugar of the continent. When hostilities began that market not only was closed to most European beet sugar, but the United Kingdom was forced to seek other sources for its sugar supply, which proved to be difficult as well as expensive. The British Empire exceeds all other countries in production of sugar, yet the United Kingdom holds second place in importation of sugar, of which approximately 90 per cent came from foreign countries, mostly European. The West India committee have presented a memorandum to the British Government which cites the advantages of having the United Kingdom obtain its sugar supply from British colonies, which it is estimated could be done if colonial sugar were given preferential treatment in the customs tariff. This legislation, if enacted, will prob-

ably tend to reduce the European beet-sugar output to local requirements and to increase considerably the production of cane sugar.

UNITED STATES.

BEET SUGAR.

Two countries, the United States and Spain, are practically the only countries that produce sugar in considerable quantities from both beets and cane. The beet-sugar industry in the United States is of comparatively recent development. There are two distinct epochs in the history of the industry in this country, the first 1830 to 1888, the second 1888 to the present time. One is characterized by its failures, the other by its success. The first sugar factory was erected in Philadelphia in 1830, but like subsequent enterprises it was unprofitable and was soon abandoned. Efforts were made about every seven years to revive the industry; experiments to locate the territory best adapted to the industry were made in all parts of the country; bounties were granted by some States; but success was not achieved until 1888. As shown by the census in 1909, the industry has been localized in three groups of States: Group I embraces the States of Arizona, California, Oregon, and Washington; Group II, Colorado, Idaho, Kansas, Montana, Nebraska, and Utah; Group III, Illinois, Iowa, Michigan, Minnesota, New York, Ohio, and Wisconsin. During the last decade one State in each of these groups exceeded all the other States in that group, and these three States, California, Colorado, and Michigan, combined, contained three-fourths of the total area under beets and produced three-fourths of the beets and sugar.

The first official record of area devoted to this crop was made for the census for 1899. The area harvested that year was 110,170 acres, which increased to 360,433[1] acres in 1909, or more than three times the area of the preceding census. Three-fourths of the area of beets harvested for each of these two years was located in three States, California, Colorado, and Michigan. The area increased in California from 41,242 acres in 1899 to 83,000 in 1909, and in Michigan from 40,247 acres to 112,232. The growth of the industry has been greater in Colorado than in any other State, as the area in that State increased from 1,094 acres in 1899 to 121,698 in 1909. The area of the United States devoted to the growing of sugar beets in 1909 was less than one-tenth of 1 per cent of the area under cultivation. The area of beets harvested increased from 242,576 acres in 1903 to 555,300 in 1912, or an average of 364,733 for the decade. The increase in area has been gradual, as is shown by the annual average of 228,000 acres during the five years 1901–1904, 374,000 during 1906–

[1] Estimate by Department of Agriculture gives 420,262 acres.

1910, and 543,000 during 1911–1915. The yield of beets per acre increased from 7.2 tons in 1899 to 10.7 tons in 1915. The average yield for the decade ending with 1912 was 9.95 tons, which varied from 8.56 tons in 1903 to 11.26 tons in 1906.

The beets used for sugar increased from 794,658 tons in 1899–1900 to 6,462,000 in 1915–16. The beets used for sugar were 2,076,494 tons in 1903–4 and 5,224,377 in 1912–13, or an average of 3,657,277 for the decade.

The price paid per ton for beets increased from $4.19 in 1899–1900 to $5.67 in 1915–16, or an average slightly in excess of $5 per ton for the period. The total value of beets used for sugar increased from $10,320,000 in 1903–4 to $36,919,000 in 1915–16. The value of beets produced, as reported by the census, increased from $3,323,240 in 1899 to $19,880,724 in 1909, an increase of nearly 500 per cent. The value of the beet crop compared with the value of all crops increased from one-tenth of 1 per cent in 1899 to four-tenths of 1 per cent in 1909. The value of beets used for sugar increased from $42.54 per acre in 1903–4 to $59.62 in 1914–15, or an annual average of $52.55 for the decade ending with 1912–13. As shown by the census, the value of beets produced per acre increased from $30.16 in 1899 to $54.60 in 1909. In 1909 the value of beets per acre was exceeded by four other crops—hops, tobacco, sugar cane, and sweet potatoes. The acre value of beets was nearly four times the value of corn or wheat, and more than four times the average acre value of all cereals.

The season for harvesting beets and making sugar begins in California late in July or early in August and in Utah, Colorado, and States farther east late in September or early in October. The sugar campaign is usually over by January, but may continue even until March. The beets are sometimes kept until time for slicing by siloing them, that is, put in piles with sufficient earth thrown over them to protect them from frost. The average length of the sugar campaign is about 90 days, and varied from an annual average for all factories during the period 1901 to 1915 from 74 to 105 days.

The year 1888 marks the beginning of successful production of beet sugar in the United States. In that year a beet-sugar factory was constructed at Watsonville, Cal. This factory had a daily working capacity of 300 tons of beets per day of 24 hours. In 1890 another factory, with a daily capacity of 300 tons of beets, was erected in Nebraska, and in 1891 three more factories, each with a daily capacity of 350 tons of beets, were constructed—one in Nebraska, one in California, and one in Utah. The number of factories continued to increase to 30 in 1899, 52 in 1905, 73 in 1912, but decreased to 60 in 1914, and in 1915 67 factories were in operation. The majority of the factories have a daily slicing capacity of from 350 to 750 tons of beets. Several factories have a daily capacity of 1,000 tons of beets, one of

2,000 tons, and one of 4,000 tons. The last is said to be the largest beet-sugar factory in the world, and produces daily from 400 to 500 tons of sugar.

The report of the census in 1909 shows a total of 31 factories in 1899, 51 in 1904, and 68 in 1909. Of these factories, 1 was idle in 1899 and 3 in 1909. These factories had a daily slicing capacity of 19,110 tons of beets in 1899, 35,900 in 1904, and 52,750 in 1909. This represents an increase of 119.4 per cent in number of factories and 176.1 per cent in capacity. The people employed numbered 2,321 in 1899, 4,726 in 1904, and 8,389 in 1909, an increase since 1899 of 261.4 per cent. Of the number employed in 1909, 108 were women and 6 were boys under 16 years of age. The number employed during different months of the year ranged from 2,206 in February to 16,807 in November. The capital invested in the industry increased from $20,141,719 in 1899 to $55,923,459 in 1904, and to $129,628,938 in 1909. The quantity of beets used increased from 794,658 tons in 1899 to 3,965,356 in 1909, the sugar produced increased from 81,729 tons to 501,682, and the value of the sugar produced increased from $7,222,581 to $45,937,629. The percentage of increase in 1909 over 1899 was: Factories, 93.3 per cent; employees, 216.6; capital, 543.6; value added by manufacture, less cost of materials, 727.6; beets used, 399; sugar produced, 513.8; and value of sugar produced, 536.

Beets for factory use are obtained from two sources—those grown on land owned or controlled by the owners of factories and those grown by independent farmers. The factories planted 17.2 per cent of the area under beets in 1899 and 11.4 in 1909. The factories produced 14.9 per cent of the beets in 1899 and 10.8 in 1909. Better results were obtained by the independent farmers in both years than by the factories. The percentage of area of beets planted by the factories for each year was greater than the percentage of beets produced. In 1909 the Pacific Coast group of States contained 20.7 per cent of the area of beets planted and produced 22.7 per cent of the beets. The Rocky Mountain group contained 47.8 per cent of the area of beets planted and produced 51.4 per cent of the beets. The Great Lakes group contained 31.5 per cent of the area of beets planted and produced 25.9 per cent of the beets. The beets grown in the Pacific coast group of States had a sugar content of 18 per cent of the weight of the beets in 1909, as against 15.1 per cent for the Rocky Mountain group and 16.6 per cent for the Great Lakes group.

Considerable improvement is shown in both quality of beets produced and in the method of sugar extraction since 1901. The percentage of sugar extraction for the United States during the five-year period 1901–1905 was 76.6 per cent, as against 81.5 per cent for the five years 1911–1915. The sugar content for these two periods

shows an increase of 7.6 per cent, compared with 14.5 per cent for sugar extraction, which indicates that the improvement in obtaining sugar from the beet has been nearly twice as great as the improvement in the quality of the beet. A similar comparison of the three principal producing States for the five-year period 1904–1908 with 1911–1915 shows an increase in sugar content of 8 per cent for California, 5.7 for Colorado, and 1.2 for Michigan. The increase in sugar extraction was for California and Colorado each 12 per cent, and for Michigan 2.4 per cent.

The annual production of sugar for the period 1863 to 1887 varied from 100 to 1,200 tons, the average being about 500 tons. In 1888–89 the production amounted to 2,084 tons and gradually increased to 32,726 tons in 1895–96, to 184,606 tons in 1901–2, to 483,612 tons in 1906–7, and to 862,800 in 1915–16. The annual average production of sugar for the decade ending with 1912–13 was 448,346 tons, as against 77,202 tons for the decade ending with 1902–3, an increase of 480.7 per cent.

Comparing the five years 1901–1905 with 1911–1915, the production of sugar increased 202.2 per cent, and the quantity of beets used for sugar increased 166.4 per cent, as compared with 138.5 per cent increase for the area harvested.

The fuel used by the beet-sugar factories in 1909 was mostly coal, amounting to 575,731 tons; oil, including gasoline, was next in importance, amounting to 554,174 barrels; the other fuels were small quantities of coke, wood, and gas. The total value of the fuel used, including rent of power, was $1,899,468.

CANE SUGAR.

The cane-sugar industry of the United States began about 1794, and has been an important industry for the farmer ever since. The cane is grown in nearly all of the Southern States from North Carolina and Arkansas south, and from the Atlantic coast to Arizona on the west. Arizona produces both beets and cane, and one establishment in that State is equipped with machinery for producing sugar from both of these products. In 1890 cane was grown in seven States, but this number was increased to twelve in 1899 and 1909. The area under sugar cane, as reported by the census, has more than doubled during the last 30 years. The area used for cane was 227,776 acres in 1879, 274,975 in 1889, 386,986 in 1899, and 476,849 in 1909. Louisiana is the principal cane-growing State and contained 80 per cent of the cane area in 1879, 68 per cent in 1889, 72 per cent in 1899, and 69 per cent in 1909. The area under cane in 1909 exceeded the area under beets by 112,756 acres, but the production of beet sugar exceeded that of cane by 167,543 tons. The production of beet sugar

during the last five years has been approximately double that of cane. In 1909 cane was grown on 278,233 farms, compared with 35,682 farms for sugar beets. The custom in Louisiana is to grow two crops of cane from one planting, thus the plowing and planting of cane occurs only every other year on the same piece of ground. The time of planting cane usually begins in September and is completed about the 1st of March. The crop grown from this planting is called "plant cane" and is harvested the following November and December. The crop produced from the preceding year's stubble is called "stubble" or "ratoon" cane, and produces less than the initial crop of plant cane. The production of cane increased from 4,202,202 tons in 1899 to 6,240,260 tons in 1909, of which 74.7 per cent was produced in Louisiana in 1899 and 79.2 per cent in 1909. The yield of cane per acre was 10.9 tons in 1899 and 13.1 tons in 1909. The value of the cane per ton decreased from $4.89 in 1899 to $4.23 in 1909, but the total value of cane produced increased from $20,542,000 in 1899 to $26,416,000 in 1909. The value of the cane per acre for these two years, respectively, was $53.08 and $55.40. Louisiana is the principal cane-growing State and produces nearly all of the cane sugar produced in continental United States. A small amount of cane sugar is produced in Texas, but the cane grown in the other ten States is mostly used for sirup. In point of area in 1909 as compared with other crops, sugar cane was third in Louisiana, being exceeded by corn and cotton, but held first place in value. The total area under cultivation in 1909 was 5,276,016 acres, of which 1,590,830 acres (or 30.2 per cent) was used for corn, 957,011 acres (or 18.1 per cent) for cotton, and 329,684 acres (or 6.2 per cent) for cane. In Louisiana the value of sugar cane exceeded the value of any other crop in 1909, and with corn and cotton formed two-thirds the value of all crops. The total value of all crops was $77,336,143, of which $17,752,537 (or 23 per cent) was sugar cane, $16,480,322 (or 21.3 per cent) was corn, and $17,324,804 (or 22.4 per cent) was cotton. The area of cane harvested for sugar in Louisiana was 310,000 acres in 1911, 197,000 in 1912, 248,000 in 1913, 213,000 in 1914, and 183,000 in 1915. The yield per acre for these five years was 19, 11, 17, 15, and 11 tons, respectively. Of the 214 cane-sugar factories in operation in 1909, all but 10 were in Louisiana. Of the total number, 192 produced sugar or sugar and sirup, and 22 only sirup. The production of cane sugar per factory was 1,702 tons in 1909, compared with an average production of 8,650 tons per beet-sugar factory. The power of the 214 cane-sugar factories in 1909 was 122,189 horsepower as against 57,202 horsepower for the 68 beet-sugar factories. Practically all of the power in both cases was steam. The number of people employed in the cane-sugar factories in 1909 was 5,313, compared with 8,389 in the beet-sugar factories. The capital invested in the cane-sugar fac-

tories was $38,000,000, expenses $26,000,000, and products manufactured $31,000,000, as against the capital invested in the beet-sugar factories of $130,000,000, expenses $37,000,000, and products manufactured $48,000,000. Of the cane-sugar factories only one reported products in 1909 valued in excess of $1,000,000, while 14 of the beet-sugar factories reported products exceeding $1,000,000 in value. From October to January sugar making in the United States is in progress in both beet and cane regions. The smallest number of people employed in each industry in 1909 was in February and the largest number was in November. Most of the cane sugar produced was raw sugar, while practically all of the beet sugar was refined.

In 1909 there were 19 sugar refineries in the United States engaged in the refining of both domestic and imported cane sugar. Louisiana and New York each contained five; California, Massachusetts, New Jersey, and Pennsylvania, two each; and Texas one. These refineries employed 10,345 people and turned out products valued at $249,000,000.

Of the cane sugar produced in the United States since 1856, 97 per cent was produced in Louisiana and 3 per cent in other States, mostly Texas. During the five-year period 1856 to 1860 the production of cane sugar in Louisiana was 132,402 tons and other States produced 5,978 tons. For the next 15 years the average annual production was less than 100,000 tons, falling as low as 44,768 tons for Louisiana and 3,818 tons for other States. For the next 15 years, 1876–1890, the production for Louisiana was slightly in excess of 100,000 tons and 7,500 tons for other States. For the 10 years 1891–1900 Louisiana produced an average of 276,000 tons and other States 5,500 tons. During the 10 years 1901–1910 the production for Louisiana averaged 350,000 tons and other States 12,900 tons. The largest quantity of cane sugar produced in Louisiana in any one year was 398,195 tons in 1904–5 and was followed closely in 1908–9 by a production of 397,600 tons. During the 11 years 1901–2 to 1911–12 Louisiana produced an average of 349,000 tons of sugar, which fell to 207,000 tons for the next four years. The production of sugar per ton of cane was 120 pounds in 1911, 142 in 1912, 139 in 1913, 152 in 1914, but only 135 in 1915.

A striking contrast is shown in the production of cane sugar compared with beet sugar. The quantity of beet sugar has gradually increased to 862,800 tons in 1915–16, while cane sugar, after an average production of 350,000 tons for the period 1901 to 1911, decreased to 292,698 in 1913–14, to 242,700 in 1914–15, and to 137,500 tons in 1915–16. During the five years 1886–87 to 1890–91 the average annual production of cane sugar exceeded 171,000 tons, as against 1,922 tons for beet sugar. During the five years 1901–2 to 1905–6 the average production of cane sugar was 364,000 tons, as against

240,000 tons for beet sugar. During the next five years, 1906–7 to 1910–11, the average production of beet sugar exceeded the cane by 116,945 tons. The annual production of beet sugar exceeded cane for the first time in 1906–7 and gradually increased to more than six times the cane sugar in 1915–16.

The production of cane sugar in Louisiana as given by A. Boucher-eau presents an interesting account of the industry, part of which is not found in other reports. As shown by his report, the area of cane ground increased from 121,991 acres in 1889–90 to 207,674 in 1898–99 and to 216,916 in 1907–8. The cane used for sugar for the same years, respectively, was 2,195,838, 4,361,177, and 4,338,320 tons, and the production of cane per acre for the same years was 18, 21, and 20 tons. There were 746 factories in Louisiana in 1889–90, which decreased to 334 in 1898–99 and to 209 in 1907–8. In 1889–90, 651 of these factories were operated by steam power and 95 by horsepower. The horsepower was gradually displaced by steam power, and in 1901–2 all the factories were operated by steam power. In 1889–90, 590 factories used the open-kettle and open-pan process for making sugar and 156 the vacuum-pan process. The factories using the open-kettle process gradually decreased to 28 in 1907–8, while the factories using the vacuum-pan process increased to 181. The 590 factories using the open-kettle process produced an average of 84 tons of sugar per factory in 1889–90, as against 606 tons for the factories using the vacuum-pan process. In 1907–8 the average was 394 and 1,838 tons, respectively, for these two classes of factories. The 746 factories in 1889–90 produced only 143,746 tons of sugar, compared with 343,755 tons for the 209 factories in 1907–8. The sugar produced per acre by the open-kettle process ranged from 1,431 pounds in 1899–1900 to 2,165 in 1895–96. The production of sugar per acre by the vacuum-pan process varied from 2,560 pounds in 1899–1900 to 3,696 in 1902–3. The production of sugar per acre by the vacuum-pan process from 1889–90 to 1907–8 was nearly twice as much as by the open-kettle process. The production of sugar per ton of cane by the open-kettle process was less than two-thirds of the quantity produced by the vacuum-pan process. The production by the open-kettle process varied from 74 to 109 pounds per ton of cane, while the vacuum-pan process varied from 132 to 168 pounds. The production of molasses increased from 18,431,988 gallons in 1889–90 to 28,069,571 in 1902–3, but decreased to 22,532,774 in 1907–8. Approximately 85 per cent of the molasses was produced by the factories using the vacuum-pan process. The production of molasses by the vacuum-pan process was as low as 26.29 gallons per 1,000 pounds of sugar, while the open-kettle process was as high as 97.61 gallons per 1,000 pounds of sugar. The average production of molasses per ton of sugar by the open-kettle process

was approximately double the quantity produced by the vacuum-pan process.

MAPLE SUGAR.

The United States and Canada are the only two countries for which data relating to production of maple sugar and sirup are available. The territory of the United States devoted to this industry is located in the northeastern part and extends from the Atlantic coast as far west as Missouri and from the Canadian border as far south as North Carolina and Tennessee. The first official figures are the census reports for 1849, which give the production of maple sugar that year as 34,253,436 pounds. Succeeding reports give 40,120,205 pounds of sugar and 1,597,589 gallons of sirup in 1859; 28,443,645 pounds of sugar and 921,057 gallons of sirup in 1869; 36,576,061 pounds of sugar and 1,796,048 gallons of sirup in 1879; 32,952,927 pounds of sugar and 2,258,376 gallons of sirup in 1889; 11,928,770 pounds of sugar and 2,056,611 gallons of sirup in 1899; 14,060,206 pounds of sugar and 4,106,418 gallons of sirup in 1909. The production of sugar has decreased more than one-half since 1849, while the production of sirup has trebled. In 1849 seven States each produced more than 1,000,000 pounds of sugar, compared with only three States producing a like amount in 1909. The seven States and the quantity of sugar produced in each in 1849 were New York, 10,357,484 pounds; Vermont, 6,349,357; Ohio, 4,588,209; Indiana, 2,921,192; Pennsylvania, 2,326,525; New Hampshire, 1,298,863; and Virginia, 1,227,665. The production for those seven States in 1909 was 3,160,300 pounds for New York, 7,726,817 for Vermont, 257,592 for Ohio, 33,419 for Indiana, 1,188,049 for Pennsylvania, 558,811 for New Hampshire, and 44,976 for Virginia. Ohio has been the leading State in the production of maple sirup, producing approximately one-fourth of the total since 1849. The production of maple sirup in Ohio increased from 370,512 gallons in 1849 to 1,323,431 in 1909. The seven other States that produced over 100,000 gallons of maple sirup in 1909 were New York, 993,242 gallons; Vermont, 409,953; Pennsylvania, 391,242; Indiana, 273,728; Michigan, 269,093; Wisconsin, 124,117; and New Hampshire, 111,500. Estimating the quantity of sugar in 1 gallon of sirup to be 8 pounds, the total production of sugar in 1859 was 52,900,000 pounds, compared with 46,900,000 pounds in 1909.

The number of farms reporting maple sugar or sirup made in 1909 was 87,537, as against 62,718 in 1899, or slightly more than 1 per cent of all farms in the United States during both years. The number of trees tapped in 1909 was 18,899,533, of which 5,586,000 were in Vermont, 4,949,000 in New York, 3,170,828 in Ohio, and 1,298,000 in Pennsylvania. The value of the sugar and sirup produced in

1909 was $5,177,509, compared with $2,636,711 in 1899, an increase of 96.4 per cent. The average value per farm was $59 in 1909 and $42 in 1899. The value of maple sugar produced was $1,074,260 in 1899 and $1,380,492 in 1909, compared with $1,562,451 in 1899 and $3,797,317 in 1909 for maple sirup. The State of Vermont led all the others in value of maple sugar produced, amounting to 43 per cent of the total in 1899 and 52 per cent in 1909. Ohio was the leading State in value of maple sirup produced, amounting to 39 per cent of the total in 1899 and 28 per cent in 1909. The production of maple sugar in Vermont has decreased nearly one-fourth during the last half century. The production in 1859 was 9,897,781 pounds, compared with 7,726,817 pounds in 1909. However, the production in 1909 was nearly double that of 1899. In 1859 four counties in Vermont each produced more than 1,000,000 pounds of sugar; in 1889 six counties exceeded that figure, and one county produced more than 2,000,000 pounds; in 1909 only two counties exceeded the million mark. For the years 1913, 1914, and 1915 Vermont has tapped annually more than 5,000,000 trees, with 4,700,000 more available but not tapped. The sugar produced in each of the years 1913, 1914, and 1915 exceeded 7,000,000 pounds, and the sirup aggregated 500,000 gallons.

SUGAR SUPPLY.

The sugar consumed in the United States during the last 125 years has been mostly of foreign origin. The West India islands have exceeded all other sugar-growing countries in providing this supply. Of the 9,114 tons imported in 1790, 8,879 tons came from the West Indies. The French West Indies furnished 4,658 tons, and the remainder came from British, Danish, and Dutch possessions in the West Indies. From 1795 to 1808 the imports of sugar were nearly evenly divided, coming from the British, Danish, Dutch, French, and Spanish West Indies. A small quantity also came from British and Dutch East Indies, Swedish West Indies, and the beet-growing countries of Europe. For 1809 and subsequently Cuba, with a few exceptions, was the source of approximately two-thirds of the sugar imported into the United States. For the four years 1897 to 1900 imports of sugar from the Dutch East Indies exceeded the imports from Cuba, and for 1897 and 1899 sugar imported from Germany exceeded the imports from Cuba. The imports of sugar into the United States are practically all raw and have shown a gradual increase from year to year. The imports in 1822 were 25,212 tons, which increased to more than 100,000 tons in 1847, 200,000 tons in 1855, 500,000 tons in 1870, 1,000,000 tons in 1883, 2,000,000 tons in 1902, and 3,000,000 tons in 1914. During the period 1822 to 1839 approximately two-thirds of the total supply of sugar

was imported. From 1840 to 1852 only about one-half was imported, and for 1853 and 1854 less than one-half. For 1855 and subsequently the imports have been approximately three-fourths of the total supply, except for the period 1863 to 1876, when the imports exceeded 90 per cent of the total supply. These imports include the shipments of sugar from the noncontiguous possessions of Hawaii, Porto Rico, and the Philippine Islands to the United States. Imports from these possessions increased from 10 per cent of the total supply in 1865 to 20 per cent in 1909 and to 25 per cent for 1910 and subsequently. The sugar brought from the noncontiguous possessions increased from 35,000 tons in 1865 to 280,000 tons in 1890 and to more than 1,000,000 tons in 1914. During 1912, 1913, and 1914 these possessions supplied one-third of all the sugar imported. The receipts from the noncontiguous territory during the decade ending with 1912–13 increased 138.5 per cent over the decade ending with 1902–3. The receipts from Porto Rico for this period increased 318 per cent, Hawaii 91.6, Philippine Islands 143.3, while the imports from foreign countries increased only 12 per cent. These increases compare favorably with the increase in production in continental United States for this 20-year period. The increase in production of sugar during the decade ending with 1912–13 over the preceding decade was 8.3 per cent for cane sugar and 20.9 for beet sugar. The exports of sugar from the United States have been mostly refined and were sent chiefly to the United Kingdom, Central American States, and the West Indies. The annual exports have exceeded 100,000 tons only four times since 1865, and ranged from 5,000 tons in 1896 to 129,000 tons in 1885 to 275,000 in 1915, and for the 12 months ending June 30, 1916, the exports were 815,076 tons. The exports during the decade ending June 30, 1913, increased 180.4 per cent over the preceding decade.

The United States exceeds all other countries in consumption of sugar, consuming annually nearly one-fourth of the world's production. The consumption of raw sugar increased from 40,612 tons in 1822 to 103,000 in 1838, 341,000 in 1852, 545,000 in 1870, 1,001,000 in 1879, 2,131,000 in 1893, 3,190,000 in 1903, and 4,397,000 in 1914. The per capita consumption of sugar in the United States was exceeded by the United Kingdom, Australia, and New Zealand. The consumption per capita in the United States has increased from 8.9 pounds in 1822 to 34.3 in 1861, but decreased to 17.8 in 1863, and increased to 28.4 in 1866, 40.6 in 1872, 54.2 in 1884, 73 in 1894, 80.4 in 1909, and 89.1 in 1914. The increase in consumption of sugar has been greater than the increase in population. For the decade ending with 1912–13 the total consumption of sugar was 42.9 per cent greater than for the decade ending with 1902–3, as against an increase of 21 per cent for population for the same period. The increase for per capita

consumption was 17.5 per cent for the 10 years 1903–4 to 1912–13 over the preceding decade, compared with an increase of 9.1 per cent of the world crop of sugar consumed in the United States. The percentage of the sugar supply of the United States contributed by domestic production during the decade ending with 1912–13, as compared with the decade ending with 1902–3, increased 36.6 per cent, by noncontiguous possessions an increase of 64.4 per cent is shown, while the percentage contributed by foreign countries decreased 20.9 per cent. Thus it is shown that the domestic production and receipts from the island possessions have gradually replaced the imports from foreign countries; that is, the percentage of the total supplied by foreign countries was lower in the latter decade, being as low as 46.6 per cent, compared with 79 per cent, the highest for the preceding decade.

HAWAII.

The principal industry in the Hawaiian Islands is the growing of sugar cane and the manufacture of raw sugar. About one-fourth of the entire population, slightly less than 50,000 people, are directly engaged in this industry, and the remainder depend upon it to a greater or less extent. The making of sugar practically continues throughout the year, though the greater portion of the crop is harvested from November to July.

The Federal census reported 86,854 acres under cultivation in 1899, of which 65,687 acres, or 75.6 per cent, were planted to sugar cane. The area in cane increased to 186,230 acres in 1909. The total value of all crops in 1899 was $19,610,551, of which $18,033,515 was sugar cane. In 1909 the total value of all crops was $28,535,677, of which $26,305,747 was sugar cane.

In 1909 the growing of sugar cane was reported by 1,028 farms, and of this number 46 were equipped with mills for making sugar. The production of cane was 2,239,000 tons in 1899, 4,240,238 in 1909, and 4,900,000 in 1913. The yield of cane per harvested acre increased from 34 tons in 1899 to 42 tons in 1911 and to 43 tons in 1913. The annual production of sugar for the last ten years has been about 500,000 tons, ranging from 367,475 tons in 1903–4 to 612,000 tons in 1913–14. The production of sugar per acre harvested increased from 8,253 pounds in 1898–99 to 11,400 pounds in 1914–15. The extraction of sugar per ton of cane was 230 pounds in 1898–99, 249 pounds in 1910–11, and 250 pounds in 1913–14. Practically all of the sugar produced in the islands has been shipped to the United States, aggregating 500,000 tons annually during the last ten years. The annual shipments to the islands from the United States during the same period amounted to more than 1,000,000 pounds of refined sugar. Imports from foreign countries have been about 50,000 pounds annually.

In 1909 there were 46 sugar establishments in the islands, of which 11 produced products that were valued at more than $1,000,000 each. The largest sugar mill in the islands produced an annual average of 49,513 tons of sugar during the period October, 1903, to September, 1914.

In the sugar industry a large amount of fuel is required, and the refuse (bagasse) from the sugar cane has almost entirely supplied the necessary fuel. As shown by the census of 1909 only a small amount of other fuel was required. The fuel used that year was 4,238 tons of coal, 10,957 cords of wood, and 215,365 gallons of oil, including gasoline.

PORTO RICO.

The making of sugar is the leading manufacturing industry of Porto Rico. The area under cane is exceeded by coffee, but the value of the cane crop in 1909 was nearly three times that of coffee. The total value of all crops in 1909 was $25,559,265, of which $13,088,812 was sugar cane. The area of cane harvested in 1899 was 61,556 acres, as compared with 145,433 in 1909 and 211,110 in 1913. In 1899–1900 there were 345 mills in operation, and in 1909–10 this number was reduced to 108, of which only 55 were in operation. The production of raw sugar was about 35,000 tons in 1899–1900 and 346,786 tons in 1909–10, or an increase of nearly tenfold in 10 years. The production of sugar was about 1,000 pounds per acre under cane in 1899–1900, which increased to more than 4,000 pounds in 1909–10. This increase was due partly to a better quality and larger production of cane per acre, but due mostly to improved methods of sugar extraction.

The average number of wage earners employed in the 108 sugar mills in 1909–10 was 5,062. The smallest number employed during any one month was 2,231 in September, and the largest number was 8,403 in March. There are three classes of factories in Porto Rico—the "central" or large mill, the "hacienda" or plantation, which has a small mill for working up the cane grown on the plantation, and the "trapichi" or small mill or grinding plant. In 1913 the average output of sugar per mill was 8,433 tons for the "centrals," 624 for the "hacienda," and 20 for the "trapichi." The "centrals" produced 398,004 tons of sugar, or 97 per cent in 1913, which ranged from 28.50 tons to 51,336.75 tons per factory.

The total production of sugar in 1909–10 was 346,786 tons, or an average per employee of 136,000 pounds for the year.

A large area of "ratoon" or "stubble" cane, that is, cane which has sprouted from the stubble of one or more cuttings, is grown in Porto Rico. The cane is permitted to grow from 4 to 15 years

before replanting. The planting of cane is carried on throughout the year, but the best season for planting is from the middle of September to the middle of January. The crop matures in about 18 months, and the greater portion is harvested during the period from January to June. Practically all of the sugar produced on the island is shipped to the United States, less than 10 per cent being retained for home consumption. The shipments of refined sugar from the United States to the island varied from 1,065 tons in 1903–4 to 8,428 in 1912–13. The annual consumption of sugar varied from 18,000 to 28,000 tons, or a per capita consumption of from 30 to 50 pounds.

PHILIPPINE ISLANDS.

The sugar production of the Philippine Islands has more than doubled during the last 12 years. In 1902–3 the area of sugar cane and the production of sugar were, respectively, 177,628 acres and 198,654 tons, which increased in 1913–14 to 418,676 acres and 408,339 tons.

In 1902–3 two islands, Luzon and Negros, produced 90 per cent of the sugar of the entire Philippine Archipelago. Luzon contained 50 per cent of the area of cane cultivated but produced only 38 per cent of the sugar, while Negros contained only 40 per cent of the area under cane but produced 52 per cent of the sugar. During the same year two Provinces, Occidental Negros and Pampanga, contained 56 per cent of the area under cane and produced 57 per cent of all the sugar produced in the islands. Occidental Negros contained 38 per cent of the area under cane and produced 49 per cent of the sugar, while the Province of Pampanga, in the Island of Luzon, contained 18 per cent of the area under cane but produced only 9 per cent of the sugar.

The cane grown in Negros is apparently much richer in saccharine matter than that from any of the other islands. The average production of raw sugar per acre of cane cultivated in all of the islands was 2,237 pounds, while the average production for Negros was 2,863 pounds, and for Luzon 1,739 pounds. In 1912–13 the production of sugar per acre of cane cultivated for all the islands was 1,585 pounds. For Negros the production was 1,842 pounds, compared with 1,531 pounds for Luzon. In 1913–14 the production of sugar per acre of cane cultivated was 1,951 pounds for all the islands, 2,536 for Negros, and 1,536 for Luzon.

Prior to 1901 the commercial value of the sugar crop of the Philippine Islands was exceeded only by that of manila hemp, but subsequent to 1900 the annual export value of sugar was three-fourths of a million dollars less than that of copra, and was much less than that of manila hemp. The total value of sugar exported during the

period 1901–1913 aggregated $70,000,000, compared with $80,000,000 for copra. The value of the manila hemp exported during the same period equaled the value of both copra and sugar.

The five principal crops of the Philippine Islands are hemp (abaca), coconuts, corn, rice, and sugar cane. The total area under cultivation in 1902, as shown by the census, was 3,209,446 acres, or slightly less than one-half of the total area of the islands. The area under the five principal crops in 1902 was 2,813,686 acres, or 87.7 per cent of the area under cultivation. The area of sugar cane cultivated was 177,628 acres, or 5.5 per cent of the area under cultivation, as compared with 45.6 for rice, 16.8 for manila hemp, 11.4 for coconuts, and 8.3 for corn. In 1912–13 the area of the five crops had increased to 5,665,000 acres and increased again the following year to 6,225,000 acres. The value of these five crops at the local markets was $82,761,000 in 1912–13 and $78,193,000 in 1913–14.

The area of cane cultivated in 1912–13 was 435,188 acres, which was exceeded by each of the other four crops. In value, at provincial markets, the sugar products held fourth place, amounting to $12,849,000, or nearly twice the value of the corn. In 1913–14 the area of cane cultivated was 418,676 acres, which was exceeded also by each of the other four crops. In value the sugar products held third place, amounting to $14,316,000, being exceeded only by rice and manila hemp. The area of sugar cane in 1913–14 decreased nearly 17,000 acres as compared with the preceding year, yet the value of the sugar products produced in 1913–14 was nearly $1,500,000 more than the previous year.

The production of sugar in 1902–3 aggregated 200,000 tons, which decreased to 168,000 tons in 1909–10, but increased to 345,000 tons in 1912–13 and to 408,000 in 1913–14.

There is a large number of small sugar mills in the Philippines, but the tendency has been toward larger and better equipped plants. There are now three mills, each having a capacity of 1,200 tons of cane per day of 24 hours.

The sugar exported from the Philippines is a low grade of raw sugar and is nearly all sent to the United States. However, for some years China and Hongkong each received more than the United States. The exports to all countries varied from 82,855 tons in 1903–4 to 234,759 tons in 1913–14. The annual average for the 11 years 1903–4 to 1913–14 was 159,093 tons. Only refined sugar has been imported into the islands, amounting to less than 3,000 tons annually. The smallest quantity imported for any one year since 1903 was 1,310 tons in 1905–6, and the largest quantity was 4,862 tons in 1911–12.

The local consumption of sugar has been estimated at about 100,000 tons, or a per capita consumption of 25 pounds. As the quantity of sugar imported is small, a fair estimate of the quantity produced may

be had by adding the estimated consumption of 100,000 tons to the exports, which would give an annual production figure slightly in excess of 200,000 tons for the last 10 years, which was increased to more than 400,000 tons in 1913–14.

CUBA.

The cane-sugar industry of Cuba dates back almost to the discovery of the island. Climatic conditions and soil are well adapted to the growing of sugar cane, with the result that nearly one-half of the cultivated area of the island has been devoted to this crop. The cane matures in from 12 to 18 months. It has been grown in the western Provinces until the land is more or less exhausted and seldom more than 4 or 7 crops are harvested without replanting. In the richer and newer lands of the eastern Provinces 10 or 12 crops and sometimes double that number may be harvested without replanting. The crop is harvested more or less throughout the year, but the principal harvest season is from December to June. In 1899 there were 60,711 farms in Cuba, containing an area of 8,762,000 acres. The area of farm land under cultivation increased from 901,077 acres in 1899 to 2,918,977 acres in 1912, or an increase of 233.9 per cent. The area devoted to cane was 414,202 acres in 1899, 849,000 acres in 1907, and 1,340,139 acres in 1912, an increase of 233.5 per cent since 1899, approximately the same rate of increase as was shown for total land under cultivation. In 1912 56 per cent of the area under cane was either cultivated or controlled by the factory owners and 44 per cent was cultivated by independent farmers who sold their cane to the factories. As an incentive to produce cane rich in saccharine matter the cane is paid for according to the sugar content and not the gross weight.

The sugar factories of Cuba have made considerable improvement in the use of modern equipment during the last few years. Close competition in the sugar market has forced Cuba, as well as other sugar-producing countries, to adopt a more economical method of manufacturing sugar. The result has been an almost constant decline in the number of factories, but an increase in their size and capacity. The number of sugar factories in Cuba decreased from 473 in 1876–77 to 157 in 1900–1901 and increased to 186 in 1906–7, but decreased again to 170 in 1913–14. The average output of sugar per factory increased from 1,231 tons in 1876–77 to 17,008 tons in 1913–14. In 1903–4 the 174 sugar factories in operation used 11,853,129 tons of cane and produced 1,178,546 tons of sugar. The factories each used an average of 68,121 tons of cane and produced an average of 6,773 tons of sugar. Ten years later a smaller number of factories used more than twice as much cane and produced

more than double the amount of sugar. The 171 factories in 1912–13 used 25,137,684 tons of cane and produced 2,737,264 tons of sugar. The average quantity of cane used per factory was 147,000 tons and an average production of 16,000 tons of sugar. During the 10 years ending with 1912–13 there was an average of 175 factories in operation, which ground an average of 15,925,000 tons of cane annually and produced 1,687,000 tons of sugar annually. The average annual quantity of cane used per factory for that period was 91,278 tons, and the average annual production of sugar per factory was 9,680 tons. The extraction of sugar per weight of cane increased from 9.88 per cent in 1903–4 to 11.27 in 1913–14. The lowest percentage of extraction for the period was 9.81 per cent in 1905–6, and the highest was 11.90 per cent in 1908–9. The production of sugar per ton of cane increased from 199 pounds in 1903–4 to 225 pounds in 1913–14, or an average production of 212 pounds for the decade 1903–4 to 1912–13.

In 1912–13 the cane yielded 19.51 tons per acre, and the cane used for sugar amounted to 25,137,684 tons, which was harvested from 1,288,451 acres, compared with 1,340,139 acres planted. The production of sugar per acre was 4,320 pounds. The sugar plantations are equipped with private railway lines to transport cane to the factories from the fields. In 1912–13 the total length of these railways was 2,802 miles, of which 865 miles were standard gauge and 1,937 narrow gauge. There were 15,161 cars and 486 locomotives in use on these railways. The total grinding capacity of the factories in operation, as reported in 1912–13, was 239,195 tons of cane per day of 24 hours. The total quantity of cane ground per day was 205,749 tons, or 84.5 per cent of their nominal capacity. The sugar content of the cane harvested in 1912–13 was 14.17 per cent of the weight of the cane, of which 10.98 per cent was extracted. The "first sugar" produced was 10.57 per cent of the weight of the cane, and the "second sugar" amounted to only 0.41 per cent. The "first sugar" had a polariscopic test of 95.95° in 1912–13 and 96.05° in 1913–14. The "second sugar" tested 89.22° in 1912–13 and 88.70° in 1913–14. Practically all of the sugar produced in 1912–13 was the grade known as "first sugar," which amounted to 10.57 per cent of the weight of the cane, or 2,603,985 tons of sugar. The "second sugar" was only 0.41 per cent of the weight of the cane, or 101,006 tons of sugar. A discrepancy exists in the above figures. The cane used for sugar was stated as 24,635,620 tons, from which the sugar extraction was 10.98 per cent, or 2,704,991 tons. The sugar produced was given as 2,781,046, an increase over the computed figure of 76,055 tons. The molasses produced was 85,581,966 gallons in 1912–13 and 98,607,799 gallons in 1913–14. The fuel used in 1912–13 consisted of 75,629 tons of coal and 400,844 tons of wood.

As a producer of cane sugar Cuba has held second place among the cane-sugar-producing countries of the globe, being exceeded only by British India. For some recent years Cuba has risen to first place. These two countries together produce approximately one-half of the world's supply of cane sugar, each producing from two to three million tons. The Cuban output of sugar was estimated at 224,000 tons in 1839–40, which increased to 500,000 tons in 1859–60, and again increased to 839,000 tons in 1867–68, but on account of the 10 years' war from 1869 to 1878 the production decreased to 582,000 tons in 1876–77 and continued at approximately that figure until 1884–85, when the production amounted to 707,000 tons, and it gradually increased to more than 1,000,000 tons in 1891–92. During the following year the production fell slightly under the million mark, but again exceeded that figure for the two years 1893–94 and 1894–95. On account of the War of Independence and the Spanish-American War, the production decreased to 300,000 tons or less during the period 1896 to 1900. At the close of this last war the business of the island was established on a firmer basis; the production of sugar gradually increased, exceeding 1,000,000 tons in 1902–3, 2,000,000 in 1909–10, and reaching to 2,891,000 tons in 1913–14. The effect of that war is shown in the following figures: During the five-year period of war the production decreased to an annual average of slightly less than 300,000 tons, while during the five-year periods immediately preceding and following the war the average production exceeded 1,000,000 tons, which increased to double that quantity, or more than 2,000,000 tons, for the five-year period ending with 1912–13.

The greater portion of the sugar produced in Cuba is exported, amounting to about 95 per cent during the last 20 years, of which about 90 per cent was sent to the United States. The United Kingdom was the best European customer. These two countries received 99.5 per cent of the sugar exported during the decade ending with June 30, 1913; the percentages were 96.8 per cent to the United States and 2.7 per cent to the United Kingdom. The Cuban consumption of sugar during the decade ending with 1912 was approximately 62,000 tons, or about 60 pounds per capita.

BRITISH WEST INDIES.

The British West Indies hold third place as a sugar-producing possession of the British Empire, being exceeded by Mauritius and British India. Prior to 1900–1901 the British West Indies exceeded Mauritius in the production of sugar, but since that time the production for Mauritius has been much larger, and for some years nearly double that of the British West Indies. The area used for sugar in

the British West Indies in 1902 was approximately 147,000 acres, as against 148,000 acres in 1912–13. The Island of Trinidad has the largest area under cane, or slightly more than one-third of the total cane area of the British West Indies. The average annual area under cane during the decade 1903–1912 was 60,000 acres, compared with 34,000 for Barbados and 29,000 for Jamaica. Statistics of sugar production for St. Lucia, St. Vincent, and the Leeward Islands are lacking, and exports of sugar have been used for those islands. The estimated production of sugar for the British West Indies decreased from 207,716 tons in 1893–94 to 190,341 in 1897–98; increased to 201,595 in 1902–3; decreased to 182,830 in 1903–4, to 169,534 in 1907–8, and to 128,532 in 1912–13. The annual production for the decade 1903–4 to 1912–13 was 161,060 tons, as against 187,920 for the preceding decade, a decrease of 14.8 per cent. The production of sugar in Trinidad during the last 10 years was slightly more than one-third that of all the islands. Barbados produced less than one-third, while the Leeward Islands and Jamaica produced another third. Each of these islands shows a decrease in the output of sugar, which was due in part to diversified farming. In Trinidad the cacao industry has exceeded the sugar industry, while in Barbados, since 1911, the manufacture of sirup and molasses has taken the place of sugar making. The production of "fancy molasses," or sirup direct from the juice of the cane, on this island in 1913 was 8,139,120 gallons, and that of "choice molasses" was 946,880 gallons.

The area of land under cultivation in Trinidad in 1913–14 was 459,675 acres, of which 336,154 acres were used for cacao, 50,742 for sugar cane, and 27,356 for coconuts. The value of the molasses produced in Barbados exceeded $1,800,000 in 1912 and 1913, while the value of the sugar produced was $1,500,000 in 1912 and $441,000 in 1913.

The exports of sugar from the British West Indies decreased from 189,369 tons in 1893–94 to 151,907 in 1895–96, and increased to 167,950 in 1902–3, or an average of 165,311 for the decade. In 1903–4 the exports of sugar were 132,066 tons, which decreased to 110,690 in 1912–13 and to 82,486 in 1913–14, or an average of 135,344 for the decade ending with 1912–13, a decrease of 28 per cent as compared with the preceding decade. The United Kingdom, Canada, and the United States have been the principal markets for West Indian sugar. During the eight years 1895–96 to 1902–3 the annual exports to the United Kingdom were 34,098 tons, or 26.7 per cent, as against 43,191 tons, or 31.9 per cent, for the ten years 1903–4 to 1912–13.

In 1903 the erection of a modern sugar factory was planned at Gunthorpe, on the island of Antigua, and was completed in time to begin operations in 1905. It had its origin in a series of agreements between a group of owners of sugar estates and a company

in London. The factory was to have a capacity of not less than 3,000 tons of sugar in a season of 100 working days, and the owners of sugar estates were to supply the cane from a stated number of acres for a period of 15 years. During the ten years 1905–1914 the factory crushed 534,988 tons of cane and produced 56,531 tons of sugar. The quantity of cane crushed increased from 17,563 tons in 1905 to 92,994 in 1914. The first year, 1905, the factory produced only 1,830 tons of sugar, which increased to 2,631 the next year, both of which were less than the quantity agreed upon. In 1907 the output of sugar was 4,739 tons, which gradually increased to 10,227 in 1914. The average percentage of sugar extraction per weight of cane for the decade was 10.57 per cent, which varied from 9.52 per cent in 1906 to 11.16 in 1910. The average quantity of cane required to produce 1 ton of sugar during this period was 9.42 tons, which varied from 8.96 in 1910 to 10.51 in 1906.

MEXICO.

CANE SUGAR.

The area upon which sugar cane is grown in Mexico is located in 18 of the 27 States. Some of these States lie along the Pacific and Gulf slopes and others in the interior just south of Mexico City. The entire country is adapted to the growing of cane, except the higher altitudes in the mountain regions and the north-central States. Approximately one-half of the Mexican sugar is produced in two States—Morelos and Vera Cruz. Two other States of importance are Pueblo and Sinaloa. In the State of Morelos rainfall is insufficient and irrigation is necessary to provide sufficient moisture for the growing of crops. The lowlands along the coast are well adapted to the growing of cane, and as many as 10 crops may be harvested from one planting. In the coast regions very little cultivation is needed and the yield has been as high as 35 tons per acre. The sugar industry is in a backward state and very little modern machinery is in use. The old open-kettle process is most in use, which extracts only about 6 per cent of sugar per weight of cane. The area used for cane in 1872 was 6,061 acres, which increased to 174,823 acres in 1909. The production of cane increased from 1,535,047 tons in 1903–4 to 3,044,574 in 1906–7, and the farm value for these two years was approximately $8,000,000 and $22,000,000, respectively. The sugar produced decreased from 112,930 tons in 1903–4 to 102,931 in 1905–6, increased to 178,134 in 1910–11, decreased to 167,258 in 1911–12, to 143,000 in 1913–14, and to 121,000 in 1914–15. The percentage of sugar extraction per weight of cane produced decreased from 7.36 per cent in 1903–4 to 4.23 per cent in 1906–7. A small amount of sugar cane grown in Mexico has been sent to the United

States. These exports amounted to 181 tons in 1903–4, 75 tons in 1905–6, 1,301 tons in 1909–10, and 75 tons in 1911–12.

The exports of sugar increased from 17,981 tons in 1903–4 to 42,600 in 1904–5, decreased to 4,643 in 1908–9, and increased to 26,546 in 1911–12. The imports have been less than the exports and increased from 1,419 tons in 1903–4 to 5,649 in 1907–8 and decreased to 1,123 in 1911–12. During the nine years 1903–4 to 1911–12 the annual production of sugar was 125,499 tons, as compared with 14,651 tons exported and 2,301 tons imported. The consumption of sugar annually for the same period averaged 113,149 tons, or 15.25 pounds per capita. The quantity of sugar produced in Mexico has increased more than threefold during the last 15 years. In 1898–99 the production was 55,000 tons, which increased to 178,000 in 1910–11, but, partly on account of the revolution, the production decreased to 121,000 tons in 1914–15. During the five years 1898–99 to 1902–3 the annual production of sugar was 95,900 tons, which increased to 124,000 during the next five years, an increase of 29.4 per cent. During the five years 1908–9 to 1912–13 the annual production was 166,000 tons, an increase of 33.8 per cent over the preceding five years. The sugar produced is practically all raw, mostly in the form of small tablets or cakes.

CANADA.

The beet-sugar industry of Canada was more or less unsuccessful until 1902. The results were so unsatisfactory to both grower and factory owner that the industry was almost entirely abandoned. However, the experience had proved that there were large areas in the Dominion on which sugar beets could be grown successfully and more profitably than other crops.

In 1901 the Legislature of Ontario set apart $225,000 to promote the growth of sugar beets for a period of three years, not more than $75,000 to be used in any one year. The act provided for a rate of one-half cent per pound for the first and second years for first-class marketable sugar and one-quarter cent for the third year. These yearly grants provided that not less than $4 per ton should be paid for the beets delivered at the factories under contract irrespective of the saccharine content for the first year. For the second and third years the price should be 33⅓ cents per ton for every 1 per cent of sugar in the beets. In 1904, $150,000 was added to the special fund and authorized a uniform payment of one-half cent per pound for refined sugar for a period of five years. The Alberta Legislature provided for a bonus of one-half cent per pound on refined sugar, produced from beet roots, at the factory for two years commencing in 1906, and one-quarter cent per pound for the three years fol-

lowing. This bonus was to be divided equally between the growers and the company. These factories were provided with machinery to refine raw sugar. Beginning November 30, 1906, additional aid was granted by a reduction in the tariff on imported sugar testing not more than 75 degrees by the polariscope of 31½ cents per 100 pounds and 1 cent for each additional degree.

The total land area under cultivation during the last 10 years aggregated 35,000,000 acres, of which the area under sugar beets varied from 16,200 acres in 1903 to 21,937 in 1911 and fell to 21,000 in 1914. The production of beets varied from 74,444 tons in 1903 to 201,000 in 1912 and 108,600 in 1914. The yield of beets per acre was only 4.60 tons in 1903, increased to 11.03 in 1910, but yielded only 8.98 tons in 1914. The value of the beet crop can be given for only 1908 and subsequently, which amounted to $578.000 in 1908, increased to $1,154,000 in 1911, and decreased to $651,000 in 1914. The average price per ton was lowest, $5, in 1912, and highest, $6.59, in 1911.

Five factories began operations in 1903, 4 in Ontario and 1 in Alberta; 2 of the factories in Ontario closed the following year and in 1908 another factory closed, but reopened for the next campaign. The slicing capacity of these factories varied from 500 to 850 tons of beets per day of 24 hours. The output of sugar varied from 7,515 tons in 1903–4 campaign to 13,773 tons in 1914–15 campaign. The sugar content and extraction are available for only 1909–10 and 1910–11 campaigns. The sugar content varied from 15 to 17.26 per cent of the weight of the beets, and the extraction varied from 13 to 14.89 per cent, or from 260 to 298 pounds of sugar to 1 ton of beets. The average length of the campaign varied from 65 to 100 days, beginning in October and ending in January, but the refining of imported raw sugar permitted the factories to operate for a longer time. One of the factories, when employed on raw sugar, had a refining capacity of 350,000 pounds per day of 24 hours.

The exports of sugar from Canada were practically nil, being as low as 2 tons in 1913. The imports varied from 183,630 tons in 1903 to 345,583 in 1914. The consumption of sugar in 1903 amounted to slightly less than 200,000 tons and gradually increased to 359,000 in 1914, or a per capita consumption of 66.6 pounds in 1903 and 92.7 pounds in 1914.

Annual statistics of the maple-sugar industry are not available, but the returns of the last four censuses indicate the annual production to be about 20,000,000 pounds. The production of maple sugar in 1880 was 20,556,049 pounds; in 1890, 25,088,274 pounds; in 1900, 17,804,825 pounds; in 1910, 10,488,340 pounds of sugar and 1,802,581 gallons of sirup. Reckoning 8 pounds of sugar to 1 gallon of sirup, the production in 1910 is equivalent to 24,908,988 pounds of sugar, valued at $2,587,413.

COSTA RICA.

CANE SUGAR.

The area of Costa Rica used for the growing of cane lies in the central and Pacific coast region. The total area under cultivation in 1910 was 3,000,000 acres, of which 32,331 acres, or 1 per cent, was in sugar cane. Three other crops exceeded cane in area that year. These crops and their areas were: Coffee, 78,528 acres; corn, 67,910; and bananas, 62,721. About two-thirds of the cane area is located in San José and Alajuela and one-third on the Pacific coast. The cane grown along the coast ripens in about 18 months, while that grown in the higher regions in the interior requires 24 months to ripen. The area used for cane increased from 25,590 acres in 1905 to 27,636 in 1907–8, to 32,331 in 1910, but decreased to 29,474 in 1914. The number of factories decreased from 16 in 1905–6 to 11 in 1914–15. The annual production of sugar during the last 10 years has not exceeded 4,000 tons and varied from 3,360 tons in 1902–3 to 2,751 in 1908–9, to 3,883 in 1911–12, and to 2,926 in 1914–15. The production of sugar is insufficient for domestic requirements, and the imports during the last 10 years varied from 6 tons in 1905–6 to 315 tons in 1912–13 and to 47 in 1914–15.

BRITISH HONDURAS.

CANE SUGAR.

Statistics of the sugar industry of British Honduras show a decline in both area and production of sugar during the last 20 years. The area in 1893–94 was 1,766 acres, which decreased to 1,412 in 1902–3, to 1,023 in 1905–6, and to 985 in 1912–13. The production of raw sugar increased from 745 tons in 1893–94 to 887 in 1902–3, but decreased to 375 in 1912–13, or an average of 587 for the decade 1903–4 to 1912–13, as against 628 for the preceding decade. The soils best adapted to growing of cane are in the northern and southern part of British Honduras; the soil in the central part is not adapted to the growing of cane and is used for other crops. The production of bananas, coconuts, mahogany, and plantains has taken the place of the sugar industry, but in 1913–14 there were still 14 sugar factories in operation, of which 9 were operated by steam power and 5 by horse power. The United States was the best market for the bananas, but Mexico was the destination for most of the sugar.

ARGENTINA.

CANE SUGAR.

The first sugar mill was established in Argentina in 1840, and the first vacuum-pan apparatus for making sugar from cane juice was introduced in 1858, but the introduction of improved machinery for

the treatment of cane did not occur until 1879. The territory suitable for the growing of sugar cane is located in the northern part of the Republic, chiefly in the Province of Tucuman. The area under cultivation for all crops increased from 32,000,000 acres in 1905 to 50,000,000 acres in 1911, of which slightly less than one-half of 1 per cent was used for cane. The area under cane increased from 151,406 acres in 1895 to 162,461 in 1905 and to 177,813 in 1912. Approximately 80 per cent of the area used for cane is located in Tucuman. It is the principal crop in that Province and covers about 50 per cent of the area under cultivation. In 1901–2, 54 per cent of the area under cultivation in Tucuman was used for cane, which decreased to 45 per cent in 1904–5 and increased to 66 per cent in 1910–11. In 1912–13 this Province contained 72 per cent of the sugar mills and produced 84 per cent of the cane and 83 per cent of the sugar. The principal harvest season is from June 1 to October 31.

Data showing production of cane are not available, but 2,338,594 tons were used for sugar in 1912–13 and 3,043,389 in 1913–14. The yield per acre is estimated at from 10 to 20 tons. The sugar extraction was 6.9 per cent of the weight of the cane in 1912–13, as against 8.8 per cent in 1913–14. The production of sugar increased from 157,513 tons in 1903–4 to 304,389 tons in 1913–14. The average annual production for the decade ending with 1912–13 was 154,396 tons, compared with 120,798 tons for the decade ending with 1902–3. The number of sugar factories decreased from 51 in 1895–96 to 42 in 1913–14. In 1912–13, 39 mills were in operation and produced 162,313 tons of sugar, or an average of 4,162 tons per factory. The next year 38 mills produced 304,389 tons, or an average of 8,010 tons per factory. The yield of sugar per ton of cane was 139 pounds in 1912–13 and 176 pounds in 1913–14.

The domestic supply of sugar in Argentina since 1895 has been approximately equal to the demand. Prior to that date the imports of sugar nearly equaled the production. During the period 1896 to 1904 a surplus of sugar was produced. The exports for that period amounted to approximately one-fourth of the production and were consigned chiefly to the United Kingdom. For 1905 and subsequently the exports have been practically nil, while the imports have increased.

The sugar imported came chiefly from France, Austria-Hungary, and Germany. The Federal Government has encouraged the industry by paying a bounty on all sugar exported, but has also levied an excise tax on one-fourth of the domestic sugar consumed at home. A maximum price has been fixed by law which is equal to the import duty; when the price of domestic sugar exceeds the price fixed by law, sugar is imported to equalize prices. The imports of sugar were 218 tons in 1903, which increased to 83,289 tons in 1913, but

decreased to 7,234 tons in 1914. The exports decreased from 20,184 in 1904 to 20 tons in 1908 and increased slightly to 66 tons in 1913 and to 71,308 tons in 1914. The small quantity of sugar exported since 1904 was due in a large measure to the agreements signed at the Brussels Convention forbidding the importation of bounty-fed sugar into the countries that became members of that convention. The average annual consumption of sugar in Argentina during the decade 1903–1912 was 182,466 tons, or 17.2 per cent more than the production. The per capita consumption of raw sugar for the same period was 64.1 pounds.

BRAZIL.

CANE SUGAR.

The area upon which sugar cane is grown in Brazil lies chiefly along the Atlantic coast, though cane is grown in nearly all of the States. Three other industries—coffee, rubber, and cocoa—are of much greater importance than sugar, but the output of sugar has been equal to local demands, with some for export. The industry has made less progress in the north, despite the natural advantages, than in the south. Very little sugar is consumed in the northern States, and the most of it produced there must be shipped south either for home consumption or for export. Transportation to the southern States is poor, the rates are high, and labor is scarce, all of which tend to retard the development of the sugar industry in the northern States, yet the northern States produce more than two-thirds of the sugar. Pernambuco alone produces annually as much as all the other States combined.

The factories are of two kinds, "usina" and "engenho." The usinas are the larger factories and have a capacity of crushing from 100 to 700 tons of cane per day of 24 hours. The large or mixed engenho crushes from 50 to 100 tons of cane per day, while the small one ranges from 5 to 50 tons. These factories produce only raw sugar, part of which is refined, but a large portion is consumed without being refined. A good deal of cane is consumed in the raw state, and in the towns freshly expressed cane juice is sold as a beverage.

The cane is planted at the beginning of the rainy season and is harvested from 12 to 18 months later in the southern States and from 11 to 14 months in the northern States. From four to six crops are cut from one planting. The yield of cane per acre varies from 15.61 to 44.61 tons, depending upon the character of the soil and season. The sugar extraction is low as compared with other cane-growing countries and ranges from 4 to 9 per cent of the weight of the cane.

In 1904–5 there were 4,000 sugar factories, of which 160 were usinas, or large mills, and 3,840 engenhos, or small mills. Three-fourths of these mills were located in three States—1,547 in Pernambuco, 857 in Alagoas, and 666 in Sergipe. The total output of sugar for all factories in 1904–5 was 328,485 tons, of which 171,959 tons (or 52.3 per cent) was produced in Pernambuco, 39,683 (or 12.1 per cent) in Alagoas, 33,069 (or 10.1 per cent) in Sergipe, and 29,762 (or 9.1 per cent) in Rio de Janeiro. The production of sugar per factory was largest, 419.18 tons, for Rio de Janeiro; the average was 111.15 for Pernambuco, 49.65 for Sergipe, 46.30 for Alagoas, and 82.12 for all factories in Brazil.

In 1911–12 there were 4,324 factories, of which 134 were usinas and 4,190 engenhos. The output of sugar per factory in the three States of Pernambuco, Alagoas, and Sergipe shows an increase over 1904–5, while a decrease is shown for the factories in Rio de Janeiro. The production of sugar amounted to 330,690 tons, of which 165,345 tons (or 50 per cent) was produced in Pernambuco, 44,092 (or 13.3 per cent) in Alagoas, 33,069 (or 10 per cent) in Sergipe, and 38,580 (or 11.7 per cent) in Rio de Janeiro. The production of raw sugar in Brazil increased from 221,000 in 1903–4 to 343,000 in 1912–13, or an average of 273,000 for the decade. In 1913–14 the production amounted to 228,000 tons, which increased to 269,000 in 1914–15. The production of sugar exceeded 300,000 tons for only three years during the 12 years 1903–4 to 1914–15. The production for these three years was 308,000 tons in 1905–6, 316,000 in 1910–11, and 343,000 in 1912–13. The exports for the decade 1905–1914 amounted to 15 per cent of the production and averaged annually 41,082 tons. The exports of sugar during the decade 1905–1914 decreased 58.1 per cent during the last five years, as compared with the first five, while the production increased 9.2 per cent for the same periods. The imports have been in negligible quantities, and averaged 112 tons annually during the decade 1905–1914. France and Germany were the principal sources for imports of sugar, while the United Kingdom was the chief destination for exports. During this period the annual consumption averaged 232,000 tons, or approximately 20 pounds per capita.

PERU.

CANE SUGAR.

The territory used for the growing of sugar cane in Peru lies chiefly along the Pacific coast, but also a small area east of the Andes Mountains is used for cane. The crop is wholly an irrigated one, as there is very little rainfall. The climatic and soil conditions are well adapted to the growing of cane. The crop is planted and har-

vested throughout the year without interruption, but the principal harvest season is from October to February. The cane in the coast region requires 18 to 20 months to mature and from 8 to 12 crops may be harvested from one planting. The varieties mostly in use were from Java, Peru, Egypt, Louisiana, and Hawaii. The Peruvian variety yielded the largest quantity of cane per acre, but the varieties from Java, Egypt, and Hawaii were richest in sugar.

The area used for sugar cane was 79,072 acres in 1910–11, 91,746 in 1911–12, and 97,743 in 1912–13. The cane crushed amounted to 1,918,028 tons in 1911–12 and 2,056,816 in 1912–13, from which 212,474 and 202,772 tons of sugar, respectively, were obtained. The yield of cane per acre for these two years was 20.91 and 21.04 tons, respectively, and the yield of sugar per acre was 4.14 and 4.09 tons. The percentage of sugar extraction per weight of cane was 11.08 per cent in 1911–12 and 9.86 per cent in 1912–13. The yield of sugar per ton of cane for these two years was 222 pounds and 197 pounds, respectively. The people employed in the Peruvian sugar factories were 16,977 in 1910–11, 19,945 in 1911–12, and 20,942 in 1912–13.

The average production of sugar per employee for these three years, respectively, was 10.15, 10.65, and 9.94 tons. The importance of the coast region as a cane-growing section is shown by the figures for 1912–13. The total production of sugar that year in the 38 factories was 202,772 tons, of which 197,737 tons, or 97.5 per cent, were produced in the coast region, as against 5,035 tons, or 2.5 per cent, for the mountain region. The production has gradually increased from 151,489 tons in 1903–4 to 202,772 in 1912–13, or an average of 176,603 for the decade. The exports decreased from 145,457 tons in 1903–4 to 121,931 in 1906–7 and increased to 194,742 in 1913–14, or an average of 143,742 tons for the decade ending with 1912–13. For this decade the exports amounted to 81.4 per cent of the production.

BRITISH GUIANA (DEMARARA).

CANE SUGAR.

The sugar-cane area of British Guiana is located chiefly in the lowlands along the coast and is protected by massive dykes. The cane areas are all reclaimed land and drained into the sea by the use of steam pumps or by sluices. In 1911 the area of drained marsh land amounted to about 160,000 acres, of which nearly one-half was in cane. The cane is transported exclusively by water along the navigable canals that run through the sugar plantations. Only two or three crops of cane are cut from one planting. Until recent years the Bourbon cane was practically the only variety planted, but that has been supplanted by other varieties, and since 1908–9 the area

planted to Bourbon cane amounted to only about one-third of the total cane area. The Bourbon cane is a product of the island once known by that name but now known as Réunion.

The area used for cane has not increased materially during the last 20 years. It has varied during that time from 66,582 acres in 1897–98 to 78,968 in 1903–4. The annual average area of cane was 69,724 acres for the decade 1893–94 to 1902–3, as against 74,461 for the decade 1903–4 to 1912–13. The statistics of production of sugar are not available prior to 1907–8, but in that year it was stated at 112,825 tons, 149,062 for 1908–9, and 129,071 for 1909–10. The exports of sugar decreased from 114,802 tons in 1893–94 to 94,957 in 1898–99, increased to 141,063 in 1902–3, and decreased to 87,159 in 1911–12. The average exports of sugar were 115,165 tons for the decade 1903–4 to 1912–13, as against 116,427 for the decade 1893–94 to 1902–3. The consumption of sugar in 1909–10 was stated at 8,400 tons, or about 50 pounds per capita. The sugar industry is the leading industry in British Guiana and furnishes employment to about one-third of the population. Other important agricultural products are rice, cacao, rubber, coffee, and coconuts. The sugar produced there is an unrefined product of a slightly yellowish color and known under the trade name of Demarara Crystals. This sugar has a special flavor not found in other sugars and brings a higher price on the English market than any other cane sugar. The three principal markets for that sugar were the United Kingdom, the United States, and Canada.

PARAGUAY.

CANE SUGAR.

The sugar-cane industry of Paraguay is of comparatively recent development and bids fair to be profitable in the future. The supply of domestic sugar has been less than one-half of the nation's requirements. The area devoted to the growing of sugar cane in 1886 was estimated at 7,286 acres and in 1911 the area was said to be about 49,000 acres. Official data are available only for the five years ending with 1914. In 1909–10 there were 16,994 tons of cane used for sugar, which decreased to 10,000 tons the following year and increased to 50,824 tons in 1913–14. The sugar produced amounted to 900 tons in 1909–10, 500 tons in 1910–11, and 2,821 tons in 1913–14. The sugar extraction was slightly more than 5 per cent of the weight of the cane, or about 100 pounds of sugar per ton of cane. The imports of sugar during the five years 1910–1914 averaged 2,312 tons annually, and the average annual consumption was 3,582 tons, or a per capita consumption of about 9 pounds. Exports are given for only one year, 1914, amounting to 464 tons, all of which was sent to Uruguay.

UNITED KINGDOM.

The United Kingdom, though a very small producer of sugar, plays an important part in the international sugar situation. It is the world's second largest sugar market, and it has been the market for most of the sugar exported from the beet-growing countries of Europe. The imports of sugar are exceeded only by those of the United States. The production of beets and sugar are not given, but must be small, as the area planted to beets varied from 51 acres in 1909 to 4,085 in 1913 and 2,334 in 1914. It can be readily seen that the production of sugar from this small area would supply a very small part of the nation's requirements. Practically all of the beets are grown in the county of Norfolk, which also contains the only sugar factory.

The exports of sugar from the United Kingdom consist of sugar that has been imported in the raw state and refined or made into candy. The annual average for the decade ending with 1913 was 34,982 tons, ranging from 50,252 in 1906 to 26,246 in 1913. The imports of sugar consist of nearly equal amounts of raw and refined. The raw sugar imported during the five-year period 1893–1897 constituted 52.1 per cent of the total imports, as against 41.4 per cent for 1900–1904 and 52.6 per cent for 1910–1914. The refined sugar imported since 1893 came chiefly from the beet-growing countries of Europe. Those same countries also supplied approximately one-half of the raw sugar imported. The cane sugar was supplied chiefly by Egypt, Java, Philippine Islands, Peru, Brazil, and the British colonies of Mauritius, British West Indies, and British Guiana. The two principal European countries contributing to the sugar supply were Germany and Austria-Hungary. During the decade 1894–1903 54.5 per cent of the sugar imported came from these two countries, 53.5 from Germany and 1.0 from Austria-Hungary. Also the imports from Java for this period amounted to 1.6 per cent of the total, and Cuba supplied 1.3 per cent. During the next decade, 1904–1913, this condition was changed. The average annual imports of sugar increased nearly 200,000 tons, while the imports from Germany decreased approximately 100,000, or 10.3 per cent. The countries of Austria-Hungary, Java, and Cuba each show a large increase. The annual imports from Austria-Hungary during the decade 1904–1913 compared with the preceding one increased approximately 250,000 tons, or 13.2 per cent. Imports from Java increased 84,000 tons and Cuba 25,000 tons. These four countries supplied slightly less than 60 per cent of the sugar during the decade 1894–1903 and approximately two-thirds during the decade 1904–1913. Germany has been the source of nearly one-half of the sugar supply of the United Kingdom for the last 20 years. During the 10 years ending with 1903 the

sugar brought from Germany amounted to 53 per cent of the total, compared with 43 per cent for the 10 years ending with 1913. The sugar imported from Germany increased from 50 per cent of the total in 1894 to 54 per cent in 1904, but decreased to 48 per cent in 1913. This decrease in imports from Germany was not the result of a new market found elsewhere for German sugar, but to an increased consumption of sugar in Germany, which caused a decrease in exports. This was one of the effects of the Brussels Convention. Export bounties were removed, which forced a reduction in the excise tax, with a consequent reduction in price, thus stimulating home consumption. The loss in imports from Germany was largely made up by Austria-Hungary. Imports from the latter country increased from two-tenths of 1 per cent in 1894 to 18 per cent in 1913. As a result of the European war, an important change occurred in the imports of sugar in 1914. The four countries mentioned above were the source of two-thirds of the sugar supply of the United Kingdom that year. Germany and Austria-Hungary were the source of one-half of this amount, while Java and Cuba were the source of the other half. The customary amount formerly received from Germany and Austria-Hungary was reduced approximately one-half in 1914. This shortage in the sugar supply from Europe was made up by increased imports from Cuba and Java. An interesting comparison is shown in imports of sugar in 1915 compared with 1913. The imports in 1913 were 2,205,571 tons, as against 1,659,992 in 1915. The value increased from $112,000,000 in 1913 to $155,000,000 in 1915, or an increase in the import price from 2.6 cents per pound in 1913 to 4.7 cents in 1915. The imports from European countries decreased from 1,797,150 tons in 1913 to 107,924 in 1915, while imports from foreign countries and British Colonies increased from 408,421 tons in 1913 to 1,552,068 in 1915. The British Empire exceeds all other countries in the production of sugar, yet the British colonies have supplied less than 9 per cent of the sugar imported into the United Kingdom during the last 20 years, and for the five years 1900–1904 the imports from the colonies were a trifle less than 5 per cent of the total. The value of the sugar imported has aggregated $100,000,000 annually during the last 20 years, the yearly range being from $91,000,000 during the five years 1893–1897 to $128,000,000 for the five years 1910–1914.

With the exception of the United States, the United Kingdom consumes more sugar than any other country. The consumption has increased gradually from 1,552,655 tons in 1894 to 2,205,983 in 1914. The per capita consumption varied from 79.91 pounds in 1894 to 95.70 pounds in 1914, which exceeds all countries except Australia and New Zealand.

GERMANY.

BEET SUGAR.

The areas devoted to the growing of sugar beets in Germany are widely scattered throughout the Empire, but the principal area is confined to three sections—the central, northern, and southeastern. In 1912–13, 50 per cent of the total area in sugar beets was located in three provinces—22 per cent in Saxony, 15 per cent in Silesia, and 13 per cent in Posen. In point of area in 1913 the sugar-beet crop was exceeded by five other crops. The crops in their order were rye 16,000,000 acres, oats 11,000,000, potatoes 8,000,000, wheat 5,000,000, and barley 4,000,000, as compared with 1,353,000 for beets.

The area devoted to sugar beets has shown a slow but gradual increase. Since 1897 the annual area devoted to this crop has exceeded 1,000,000 acres. In 1901–2 the area was 1,182,989 acres, which decreased to 1,056,708 acres in the following year. Although there was almost a gradual increase, the area did not reach the 1901–2 figure again until 1911–12, when the area was 1,353,181 acres, which decreased the following year to 1,316,655 acres. The average area of beets harvested annually for the ten years 1903–4 to 1912–13 was 1,143,208 acres, compared with 1,056,065 acres for the 10 years 1893–94 to 1902–3. This represents an average annual increase of 8,714 acres during the 10 years subsequent to the Brussels Convention compared with the 10 years preceding the convention.

The production of beets in 1901–2 was 17,650,983 tons, which exceeded the production for any year prior to 1912–13. In the latter year the production was 18,344,738 tons, which increased in 1913 to 18,672,939 tons. The average annual production for the 10 years 1903–4 to 1912–13 was 14,583,883 tons, compared with 14,162,151 tons for the preceding decade.

The average annual production per acre for the decade 1903–4 to 1912–13 was 12.75 tons, compared with 13.41 tons for the decade 1893–94 to 1902–3. The decrease in the latter decade is due chiefly to the low yield of 8.03 tons in 1911–12. The low average yield that year was caused by a severe drought that affected all of the crops of western Europe. If the yield in 1911–12 had been normal—that is, 6 tons more per acre—the 10-year average would have been 13.35 tons, or practically the same as the preceding decade. The highest average production of beets per acre for any one year was 14.92 tons in 1901; this was followed closely in 1905 by 14.90 tons and in 1910 by 14.72 tons. The farm value per ton of beets has increased from $3.84 per ton in 1903–4 to $5.42 in 1911–12, or an average for the decade of $4.56. The value of beets per acre ranged from $52 in 1903–4 to $70 in 1912–13. The year of 1911–12 was noted for two characteristic features: The price paid the grower, $5.42, for beets

was the highest for the decade, while the value per acre, $44, was the lowest for the decade. The average value per acre for the entire period was $58.

The beets for German factories are obtained from three sources, and are defined as factory beets, stockholders', and purchased beets. The factory beets are grown on land owned or leased by the factory; the stockholders' beets are grown by individual members of agricultural societies, who own the most of the sugar factories; and the purchased beets are bought in the open market and are grown by independent growers and stockholders not on contract. Beets grown on contract are usually from one kind of seed, supplied gratis by the factory with which the contract is made.

A striking comparison is shown in the production of beets by the three classes of beet growers. The percentage of area cultivated by each class of growers was practically the same as the percentage of production of beets by each class. Expressed as percentages of the total area under beets, the area grown by the factories was 6.5 per cent, stockholders' and other contract beets 39.5 per cent, and independent growers 54 per cent. The quantity of beets produced was 6.7 per cent by the factories, 39.4 per cent by the stockholders, and 53.9 per cent by the independent growers. The average productions per acre by the three classes of growers were remarkably uniform. The factories produced an average for the decade 1903–4 to 1912–13 of 13.04 tons per acre, stockholders 12.72 tons, and independent growers 12.75 tons.

The area and production of beets and sugar have gradually increased for a number of years, but the number of sugar factories has gradually decreased. This would indicate that the factories have been increased in capacity. During the decade ending with 1912–13 the factories decreased from 384 in 1903–4 to 342 in 1912–13. In 1874–75 there were 332 factories, which gradually increased to 468 in 1893–94 and then decreased to 342 in 1912–13, or a loss of 126 factories in the last 20 years. The average number of factories in operation during the decade ending with 1912–13 were 362, compared with 456 for the preceding decade. The average annual output of sugar per factory during the decade ending with 1912–13 was 6,170 tons, compared with 4,372 tons during the previous decade. The production of sugar per factory increased from 4,428 tons in 1904–5 to 8,484 in 1912–13. The production of raw sugar increased from 2,008,932 tons in 1903–4 to 2,901,564 in 1912–13, or an annual average for that period of 2,233,553 tons, compared with 1,993,509 tons during the preceding 10-year period. The production of raw sugar per ton of beets varied from 288 pounds in 1903–4 to 316 in 1912–13. The highest average production per ton of beets during the period 1903–4 to 1912–13 was 335 pounds, compared with 317 pounds for

the preceding 10 years. The annual average production per ton of beets during the decade 1893–94 to 1902–3 was 280 pounds, compared with 306 pounds for the following decade.

In addition to the factories producing sugar from beets, there were six factories that produced sugar from molasses. The molasses remaining at the beet factories was sent to the molasses factory to be further treated. This process resulted in the production of a large quantity of sugar which materially assisted in increasing the value of the factory products. The molasses remaining after this treatment is further used for stock feed, fertilizer, and chemicals. The average annual production of molasses by the sugar-beet factories during the decade 1903–4 to 1912–13 was 335,546 tons. The raw sugar from the beet factories is sent to the refineries for further treatment, after which it is released for home consumption and export. The number of refineries decreased from 48 in 1904–5 to 31 in 1912–13.

The sugar production of Germany is far in excess of the nation's requirements, but the surplus has decreased during the last 20 years at the rate of 42,000 tons annually. During the decade ending with 1912 the exports amounted to 41.3 per cent of the sugar produced, or an annual average of 920,262 tons. The exports for the preceding decade were 1,161,620 tons, or 58.3 per cent of the production. The imports for both decades were small, but decidedly greater in the last decade than in the one preceding. The imports for the decade ending with 1912 were 13,353 tons, compared with 1,614 tons during the preceding decade. The consumption of sugar has more than doubled during the last 20 years, and increased from 569,481 tons, or a per capita consumption of 22.3 pounds in 1893–94 to 1,413,489 tons, or a per capita consumption of 42.3 pounds, in 1912–13. The annual average consumption during the decade 1903–4 to 1912–13 was 1,202,902 tons, or an average of 38 pounds per capita, compared with 707,506 tons, or 25.8 pounds per capita, for the preceding decade. Expressed as a percentage of production the consumption during the 10 years ending with 1912–13 was 53.9 per cent, as compared with 35.5 for the preceding 10 years. The increase in consumption was due partly to a reduction of the sugar tax, with a consequent lowering of the retail price, and to the rapid growth of chocolate, cocoa, and other sugar-consuming industries.

AUSTRIA-HUNGARY.

BEET SUGAR.

The area devoted to the growing of sugar beets in Austria-Hungary is located principally in the western and northwestern part of the Empire. The total area under cultivation during the decade

1903–1912 was 62,000,000 acres, of which 871,986 acres, or 1.4 per cent, was used for sugar beets. During this period 67.1 per cent of the area under beets was located in Austria and 32.9 per cent in Hungary. The area under beets decreased from 871,294 acres in 1893 to 711,784 in 1902 and increased to 1,088,088 in 1912. The average annual area under beets during the decade 1903–1912 was 871,986 acres, compared with 787,286 acres for the decade 1893–1902, an increase of 10.7 per cent. The production of beets was 5,439,735 tons in 1883, 7,142,514 in 1893, 8,196,853 in 1903, and 14,069,183 in 1912. The annual production of beets during the decade 1893–1902 was 7,791,509 tons, which increased to 9,488,812 for the decade 1903–1912, an increase of 21.8 per cent, as against an increase of 10.7 per cent for area under beets. The production of beets per acre increased from 8.2 tons in 1893 to 10.3 tons in 1902 and 12.93 tons in 1912. The average annual production of beets per acre increased from 9.9 tons during the decade 1893–1902 to 10.88 tons during the decade 1903–1912, an increase of 9.9 per cent.

The factories in operation decreased from 230 in 1903–4 to 214 in 1912–13, or an average of 217 for the decade. The beets used for sugar varied from 8,500,661 tons in 1903–4 to 13,911,305 in 1912–13, an average of 9,707,797 tons for the decade. The average annual quantity of beets used was 5,799,503 tons for the decade 1883–84 to 1892–93, 8,374,545 tons for the decade 1893–94 to 1902–3, and 9,707,797 tons for the decade 1903–4 to 1912–13. The sugar produced increased from 1,230,087 tons in 1903–4 to 2,093,439 in 1912–13, or an average of 1,435,525 for the decade. Comparing the area of beets harvested annually during the decade 1903–4 to 1912–13, an increase of 10.8 per cent is shown over the decade 1893–94 to 1902–3, and an increase of 35.5 per cent over the decade 1883–84 to 1892–93. The beets used for the same periods increased 15.9 per cent and 67.4 per cent, while the sugar produced increased 31 per cent and 115.7 per cent, respectively. The beets used per factory were 44,736 tons during the decade 1903–4 to 1912–13, as against 36,570 tons for the preceding decade. The production of sugar per factory for these two decades was 6,615 and 4,785 tons, respectively. Austria far outranks Hungary in the production of beets and sugar, but the increase during the last 20 years has been much greater for Hungary than for Austria. During the ten years 1893–94 to 1902–3 Austria contained 74.1 per cent of the area of beets harvested in the Empire, produced 77 per cent of the beets and 81.6 per cent of the sugar. During the next decade, 1903–4 to 1912–13, Austria contained 67.1 per cent of the area of beets harvested, producing 69.6 per cent of the beets and 71.8 per cent of the sugar. The sugar extraction per weight of beets increased from 13.08 per cent for the decade 1893–94 to 1902–3 to 15.29 per cent dur-

ing the decade 1903–4 to 1912–13. The average production of sugar per ton of beets increased from 262 to 296 pounds for these two decades, respectively. The average production of sugar per acre for the same periods was 2,783 and 3,377 pounds. Of the 217 factories in Austria-Hungary in operation during the decade 1903–4 to 1912–13, 194 were in Austria, but they are much smaller than the Hungarian factories. During this period the average area of beets per factory was 3,014 acres for Austria and 12,487 for Hungary. The Austrian factories each annually used an average of 36,895 tons of beets and produced an average of 5,312 tons of sugar. The Hungarian factories each used annually 110,881 tons of beets and produced 17,610 tons of sugar, a little more than three times the amount produced by the Austrian factories.

The consumption of sugar in Austria-Hungary has more than doubled during the last 20 years. The consumption was 354,105 tons in 1892–93, which increased to 756,300 tons in 1913–14. The average consumption of sugar for the five years 1898–99 to 1902–3 was 428,007 tons, which increased to 705,918 tons during the five years 1909–10 to 1913–14, an increase of 64.9 per cent. The per capita consumption increased from 18.5 pounds in 1900–1901 to 29.8 pounds in 1910–11.

The imports of sugar into Austria-Hungary have been small, but have increased from an annual average of 39 tons during the decade 1884–1893 to 167 tons for the decade 1894–1903 and to 930 tons for the decade 1904–1913. The exports have more than quadrupled during the last 30 years, and have increased from 280,200 tons in 1884 to 1,184,383 tons in 1913. During the decade 1894–1903 the annual exports were 693,711 tons, as against 378,282 for the preceding decade, an increase of nearly 100 per cent. During the decade 1904–1913 the annual exports were 754,721 tons, as against 693,711 for the preceding decade, an increase of only 8.8 per cent. Thus the exports during the 10 years since the adoption of the terms of the Brussels Convention show a much smaller percentage of increase than for the 10 years preceding the convention. The percentage of the sugar crop exported increased from 56 per cent during the decade 1884–1893 to 63.1 per cent for the decade 1894–1903, but decreased to 52.6 per cent for the decade 1904–1913. For the last 20 years and more the United Kingdom has been the principal market for Austro-Hungarian sugar, receiving as much as all other countries combined. During the decade 1893–1902 that country received 46.4 per cent of the exports of sugar from the Dual Monarchy, which was equivalent to 28.3 per cent of the sugar output. During the decade 1903–1912 the United Kingdom received 48.9 per cent of the sugar exported, which was equivalent to 27.9 per cent of the sugar produced during that period.

AUSTRIA.

BEET SUGAR.

The principal sugar-producing area of Austria-Hungary for a number of years has been located in Austria. This Empire contained two-thirds of the area of the Dual Monarchy devoted to sugar beets during the last 10 years, and produced more than three-fourths of the beets and sugar. The principal beet-producing area is in the western part, in the Provinces of Bohemia, Moravia, and Lower Austria. During the 10 years 1903–1912 Bohemia contained 58.4 per cent of the area of Austria under beets and produced 61.3 per cent of the beets; Moravia contained 31.8 per cent of the area, but produced only 14.4 per cent of the beets; Lower Austria contained 5.3 per cent of the area and produced 3.9 per cent of the beets. The total area of Austria under cultivation during the decade 1903–1912 was 27,000,000 acres, of which 584,787 acres, or 2.2 per cent, was devoted to sugar beets. The area under beets has not increased materially during the last 20 years. The annual average during the decade 1893–1902 was 583,496 acres, as against 584,787 for the decade 1903–1912, an increase of only 0.2 per cent. The production of beets for the same period increased 10.1 per cent and the output of sugar increased 15.3 per cent. These percentages are in wide contrast to the same data for Hungary, where the increases for the same periods were 40.9 per cent for area, 61.1 per cent for beets produced, and 100.5 per cent for the output of sugar. The yield of beets per acre in Austria increased from 11.49 tons in 1903 to 13.36 in 1912, or an average of 11.25 for the decade.

The number of factories in Austria decreased from 209 in 1903–4 to 186 in 1912–13. The beets used for sugar increased from 6,473,668 tons in 1903–4 to 9,370,873 in 1912–13, or an average of 7,157,539 for the decade, which was 8.4 per cent more than was produced. During the 10 years 1903–1912 Austria-Hungary imported annually 64,902 tons of beets, valued at $285,283. These beets were mostly worked up in Austrian factories and came chiefly from Germany. The sugar output of the Austrian factories increased from 896,055 tons in 1903–4 to 1,441,152 in 1912–13, or an average of 1,030,476 for the decade. The sugar extraction of beets grown in Bohemia was higher than for any other Province in the whole Empire. The average sugar extraction for Bohemia for the decade 1903–4 to 1912–13 was 15.9 per cent of the weight of the beets. The lowest extraction for the decade was 14.7 per cent in 1911–12, and the highest was 17.9 per cent in 1908–9. The average extraction for the balance of Austria for the decade was 15.4 per cent and varied from 13 to 16.5 per cent. The sugar produced per acre in Bohemia increased from 3,983 pounds in 1903–4 to 4,693 in 1912–13, or an average for the decade of 3,990, as com-

pared with 3,454 pounds per acre for the remainder of Austria and 2,554 pounds for Hungary. During the decade 1903–4 to 1912–13 the Austrian factories employed annually an average of 73,856 people, or an average of 380 per factory. In 1912–13, 74,000 people were employed, of whom 59,000 were men and 15,000 were women. The annual production of sugar per employee was 14.94 tons, as against 22.97 per employee in the Hungarian factories.

HUNGARY.

BEET SUGAR.

The area used for sugar beets in Hungary is confined chiefly to the valleys of the Danube and Tisza Rivers. The total area under cultivation during the 10 years 1903–1912 was 35,000,000 acres, of which 287,199, or 0.8 per cent, were used for sugar beets. The area under beets shows a large increase during the last 30 years. The area was 88,998 acres in 1883, 207,188 in 1893, 228,355 in 1902, and 449,910 in 1913. The average for the decade 1883–1892 was 120,757 acres, as against 203,790 for the decade 1893–1902 and 287,199 for the decade 1903–1912. The area under beets during the last decade has nearly doubled, increasing from 237,619 acres in 1903 to 449,910 in 1913. The beets produced have more than doubled, and increased from 2,328,759 tons in 1903 to 5,334,812 in 1912, or an average of 2,884,128 for the decade. The production of beets in Hungary shows a greater increase during the last 30 years than any other European country. The quantity produced was 813,408 tons in 1883, 1,715,459 in 1893, 2,164,397 in 1903, and 5,362,690 in 1913. Data for the sugar-beet industry during the decade 1903–4 to 1912–13 as compared with the preceding decade show remarkable improvement. The increase in area used for beets was 40.9 per cent, as against 61.1 per cent for beets produced. The beets used for sugar increased 52.6 per cent, while the sugar produced increased 100.5 per cent. The number of factories increased 15 per cent and the quantity of beets used for sugar per factory increased 32.7 per cent, compared with an increase of 74.4 per cent for sugar produced per factory.

The farm value of beets produced increased from $6,980,786 in 1903 to $22,979,500 in 1912, or an average of $10,691,607 for the decade. The average price per ton ranged from $3 in 1903 to $4.30 in 1912, or an average of $3.58 for the decade. The production of beets per acre increased from 9.80 tons in 1903 to 12.27 in 1912. The average for the decade was 9.86 tons per acre, as against 8.79 for the preceding decade, an increase of 12.2 per cent. The number of factories increased from 21 in 1903–4 to 28 in 1912–13, or an average of 23 for the decade, compared with 20 for the preceding decade. The quantity of beets used for sugar was more than doubled during

each of the last two decades. During the decade 1903–4 to 1912–13 the beets used increased from 2,026,993 tons to 4,540,432, or an average of 2,550,258 for the decade, compared with 1,671,293 for the preceding decade, which increased from 1,093,032 to 2,300,800 tons. During the decade 1903–4 to 1912–13, 88.4 per cent of the beets produced were used for sugar as compared with 93.3 per cent for the preceding decade. The production of sugar increased from 334,032 tons in 1903–4 to 651,587 in 1912–13, or an average of 405,049 for the decade, as against 201,985 for the decade 1893–94 to 1902–3, an increase of more than 100 per cent. The percentage of sugar extraction per weight of beets during the last 10 years increased from 13.9 per cent in 1902–3 to 15.6 in 1907–8, 16.5 in 1908–9, but decreased to 14 in 1912–13, and averaged 14.1 for the decade, as against 12.1 per cent for the preceding decade. The production of sugar per acre increased from 2,633 pounds in 1903–4 to 3,148 in 1912–13. The average for the decade was 2,554 pounds, as against 1,982 for the preceding decade, an increase of 28.9 per cent. The area of beets per factory increased from 10,190 acres during the decade 1893–94 to 1902–3 to 12,486 acres during the following decade, an increase of 22.5 per cent. The beets used per factory were 96,523 tons in 1903–4 and 162,158 in 1912–13, or an average for the decade of 110,881, as against 83,565 tons for the decade 1893–94 to 1902–3, an increase of 32.7 per cent. The production of sugar per factory increased from 15,906 tons in 1903–4 to 23,271 in 1912–13. The average for the decade was 17,610 tons, compared with 10,099 for the preceding decade, an increase of 74.4 per cent. The production of sugar per ton of beets averaged 242 pounds annually during the 10 years 1893–94 to 1902–3, and 318 pounds during the next 10 years, an increase of 31.4 per cent. The number of people employed in the Hungarian sugar factories increased from 14,422 in 1903–4 to 22,894 in 1912–13. The average for the decade was 17,635, of which 14,560 were men and 3,075 were women. The average production of sugar per employee during the last 10 years was 22.97 tons.

The Brussels Convention, which went into effect on September 1, 1903, exacts, on the part of each signatory Government, a scrupulous supervision of every refinery to insure that no untaxed sugar reaches the market. The following is a brief description of the control exercised by the Hungarian Government as reported by the United States consul stationed at Budapest:

> Four weeks prior to the commencement of the manufacturing season each refinery is required to file with the Government a detailed plan of its factory, with a full description of its machinery and the marks or trade designations which will be used on its products. The refinery must be inclosed within a boundary wall 2 meters (6½ feet) high, with no direct communication to the interior of the factory. The plan must clearly indicate the exits from this

boundary wall. At every gate there is a watch room for the internal-revenue guard, and the factory is also required to provide living rooms for at least four guards, with an office and quarters for the revenue officer. The officer checks the production of the refinery and every shipment leaving it. These shipments may be made only between the hours of 6 a. m. and 7 p. m., in quantities not smaller than 500 kilograms (1,100 pounds), and from specially designated gates. The Government, through its fiscal officers located at the refineries, thus has complete control of sugar production and withdrawals from the factories for consumption.

RUSSIA.

BEET SUGAR.

The area devoted to the growing of sugar beets in European Russia extends practically over all of the southern half of that portion of the Empire. The principal area devoted to the crop is confined to six Provinces—Kiev, Podolia, Karkov, Kursk, Volhynia, and Warsaw. The area under beets increased nearly 40 per cent during the last 10 years, yet the increase in the area of cultivated land was such that the relation of beet area to the cultivated area was unchanged. The area under beets occupies approximately one-half of 1 per cent of the area under cultivation. The principal beet district is in the Provinces of Kiev and Podolia. These two Provinces contain nearly one-half of the sugar factories. The area of beets planted in Russia increased from 1,363,535 acres in 1903–4 to 1,896,410 in 1912–13, or an average for the decade of 1,517,887. The supply of beets is obtained from two sources, those grown on land cultivated or controlled by the factories and those grown by independent farmers. The area of beets planted by the factories was about one-third of the total area under this crop, and increased from 459,532 acres in 1903 to 582,825 in 1912. The area planted by independent farmers increased from 904,003 acres in 1903 to 1,313,585 in 1912. The area of beets harvested increased from 1,331,892 acres in 1903 to 1,847,313 in 1912, an average for the decade of 1,481,857, or 97.6 per cent of the area planted. The average area harvested during the decade ending with 1902–3 was 1,079,076 acres. The area harvested has more than doubled during the last 20 years, and increased from 825,644 acres in 1893–94 to 1,847,313 in 1912–13. Slightly better results were obtained from the area of beets grown by the factories than by the independent farmers. During the 10 years 1903–4 to 1912–13 the factories harvested 98.9 per cent of the area of beets planted, while the independent farmers harvested 97 per cent. The area of beets harvested per factory increased from 3,653 acres in 1893–94 to 6,437 in 1912–13.

The production of beets increased from 8,617,655 tons in 1903 to 14,940,490 in 1911, or an average of 10,386,550 tons for the 10 years ending with 1912. The average production of beets per acre for the

decade ending with 1912 was 6.9 tons, compared with 6.7 tons for the decade ending with 1902. The lowest yield for this 20-year period was 5.5 tons in 1900, and the highest was 8.9 in 1910. The quantity of beets used for sugar increased from 7,183,974 tons for the decade ending with 1902–3 to 10,206,556 tons for the decade ending with 1912–13, an increase of approximately 50 per cent. Of the beets produced during the decade ending with 1912–13, 98.3 per cent were used for sugar.

In most of the sugar-producing countries the tendency has been to reduce the number of factories, with a consequent increase in capacity. The opposite has been the case in Russia, except that a slight increase in capacity is shown. In 1913–14 there were 87 more factories in operation than in 1893–94 and 20 more than in 1903–4. In 1903–4 the average quantity of beets used per factory per day of 24 hours was 436 tons, which increased to 574 in 1911–12, but decreased to 524 in 1912–13. The annual production of sugar per factory increased from 4,202 tons in 1903–4 to 4,745 tons in 1912–13.

The daily average quantity of beets used by all factories varied from 121,908 tons in 1903–4 to 160,794 in 1911–12. The sugar content per weight of beets varied from 14.87 per cent in 1909–10 to 19.01 in 1907–8, or an average of 17.28 per cent for the decade ending with 1912–13. The percentage of sugar extracted, compared with the weight of the beets, varied from 11.35 per cent in 1905–6 to 14.87 in 1909–10, or an average of 13.30 for the decade ending with 1912–13. The loss [1] of sugar in the beets for the decade just mentioned was 3.98 per cent, equivalent to 393,496 tons of sugar, part of which was in the molasses. The production of sugar increased from an annual average of 892,236 tons for the decade ending with 1902–3 to 1,370,197 tons for the decade ending with 1912–13, an increase of 53.6 per cent compared with an increase of 42.1 per cent in the quantity of beets used. The annual production of sugar during the last 10 years increased from 1,147,268 tons in 1903–4 to 1,361,842 in 1912–13, or an increase of 18.7 per cent, while the beets used for sugar increased 35.9 per cent. The production of sugar in 1912–13 was nearly double the production in 1893–94, or an increase of 92.2 per cent, compared with an increase of 85.3 per cent in quantity of beets used for the same years. The production of sugar per ton of beets varied considerably, the lowest being 227 pounds in 1905–6 and the highest 297 pounds in 1909–10. The average for the 10 years ending with 1912–13 was 266 pounds, as against 247 pounds for the preceding decade. The annual production of molasses during the last 10 years averaged approximately 400,000 tons, or about 75 pounds per ton of

[1] Loss = difference between the sugar in the beets and the sugar actually extracted from them.

beets. The production of molasses stated in tons was about one-third that of sugar. The consumption of sugar shows a large increase, from 840,832 tons in 1903–4 to 1,490,989 in 1912–13. The per capita consumption of sugar increased from 12 pounds in 1903–4 to 17.4 pounds in 1912–13. The consumption of sugar during the last 10 years has more than kept pace with the population, increasing 77 per cent, while the population increased only 22 per cent. During this period the beet-sugar factories of Russia employed annually nearly 120,000 people. The employees in 1912–13 numbered 124,452, of which 101,531 were men, 18,060 were women, and the children under 15 years of age were—boys, 4,958; and girls, 803.

Russia was not a party to the Brussels Convention, but became a member on December 19, 1907, on condition that the Russian Government be authorized to maintain its interior legislation, which involved alleged indirect premiums. Also Russia agreed to having a limit placed upon its sugar exports. Thus the exports of sugar from Russia for the period September 1, 1909, to August 31, 1913, were fixed at 200,000 metric tons[1] (220,460 short tons). The same quantity was stated for the period 1913–1918, but in view of the scarcity of sugar on the European market and the increase in price, Russia was authorized to export an additional amount of 250,000 metric tons (275,575 short tons). Since becoming a member of the Brussels Convention the annual exports of sugar from Russia exceeded the amounts agreed upon in four different years. The exports for those four years were 329,000 tons in 1908, 226,000 in 1909, 500,000 in 1911, and 415,000 in 1912. The large exports in 1911–12 were made necessary on account of the drought in western Europe in 1911. During 1911 and 1912 the United Kingdom took nearly one-half of the sugar exported from Russia, amounting to 229,000 tons in 1911 and 161,000 tons in 1912. Exports to Germany for those two years were 43,000 and 15,000 tons, respectively. Turkey, Persia, and Finland have been the chief markets for Russian sugar. During the four years 1910–1913 the annual exports to those three countries were 89,330 tons to Persia, 41,529 to Turkey, and 49,977 to Finland. The total exports were 199,427 tons in 1904, which increased to 500,064 in 1911, but decreased to 162,419 in 1913. The average annual exports for the decade ending with 1913 were 241,202 tons, which was 17.6 per cent of the production. During the decade ending with 1902, 15.9 per cent of the sugar crop was exported, amounting to 141,531 tons. Comparing the data for the decade 1904–1913 with the preceding decade, the exports increased 46.7 per cent, while the production increased 53.6 per cent. The imports, though small, have increased during the decade 1904–1913, being for that period 3,051 tons annually, as against 375 tons for the preceding decade.

[1] Metric ton of 2,204.6 pounds.

During the last 10 years the imports fluctuated between 74 tons in 1909 and 11,392 tons in 1910. The quantity of sugar to be exported and the quantity to be placed on the home market are previously determined for each year by an imperially confirmed resolution of the Council of Ministers. The calculation is made on the basis of the consumption of the previous year and the probable annual increase. The manufacturers are compelled to keep a certain quantity as free reserve, and also a determined amount as inviolable reserve. The Government controls the price of sugar, and on the 1st of September, which is the beginning of the sugar year, a maximum price is fixed for the year. The year is divided into two parts, the first period being the first four months and the second period the last eight months. During the five years 1907–8 to 1911–12 a slightly higher price prevailed during the last period of the year.

FRANCE.

BEET SUGAR.

France ranks fourth among the countries of Europe in the growing of sugar beets, and for some recent years is surpassed by the United States. The total area under cultivation in 1892 was stated at 64,000,000 acres. In each of the years 1909, 1910, and 1911 it was stated at slightly more than 58,000,000 acres. The average area devoted to the growing of beets during the last twenty years has been about 600,000 acres, or about 1 per cent of the land under cultivation. The area since 1903 has decreased slightly as compared with the ten years preceding that date.

In 1882 the area of beets harvested was 587,001 acres. This area was reduced to 478,499 acres in 1885, and increased to 837,195 acres in 1901, which was the largest area in beets in the history of the industry. The area decreased in 1904 to 503,521, and increased with slight fluctuations to 566,539 acres in 1912. The yield per acre has been nearly uniform since 1886. The yield that year was 14.41 tons per acre, but decreased to 11.76 the following year, and the annual average yield since that date has been about 12 tons per acre. The year of largest production of beets was 1883, amounting to 9,969,414 tons, which decreased in 1887 to 5,648,083. The next year of large production was 1901, amounting to 9,939,948 tons, but decreased slightly more than one-half three years later, and in 1904 amounted to 4,922,157 tons. The following year, 1905, the production increased to 8,445,912 tons, but has been less than 7,000,000 tons since that time, except in 1912, when the production was 7,960,926 tons. The farm value of beets varied from $21,348,000 in 1885 to $44,874,000 in 1900. The average for the period 1885 to 1902 was about $30,000,000. The farm value in 1903 was $25,030,000, but fell to $17,707,000 the follow-

ing year, the lowest during the period. This was due to both the low price of beets and the small production. The production in 1911 was lower, but the price was higher. The next year of large values was in 1912, amounting to $39,794,000. The average annual value of beets during the period 1903 to 1913 was about $25,000,000.

During the period 1885–1902 the average annual farm price per ton of beets was $4.10; the average price paid by the factory for the same period was $4.66. During the period 1903–1912 the average farm price per ton was $4.40, while the factory price was $4.33. The factory price during this period, as computed, was 7 cents below the farm price. During the latter period the factory price, as stated in the original, was lower than the farm price for the sugar campaigns of 1906–7, 1907–8, 1908–9, 1909–10, and 1911–12.

The number of sugar factories annually in operation has decreased more than one-half since 1882–83. The number that year was 497, and the number in 1912–13 was 213. During the 10 years preceding the Brussels Convention the average number of factories in operation annually was 340. During the 10 years following the convention the average number decreased to 255. The annual supply of beets used for sugar during the first period was 7,941,333 tons, and during the second period the quantity used was 6,507,075, a decrease of 1,434,000 tons annually. The annual production of refined sugar during the first period amounted to 847,337 tons, compared with 778,760 tons in the second period, or an annual decrease of 68,577 tons. The average annual production of sugar per factory during the first period was 2,492 tons, and during the second period 3,054 tons. The number of people employed in the sugar factories were 62,047 in the campaign year 1883–84, 49,971 in 1893–94, 42,632 in 1903–4, and 34,314 in 1912–13. The greater portion of the employees were men, ranging from 47,300 in 1883–84 to 31,764 in 1912–13. In 1883–84 there were 7,687 women and 7,060 children employed in the sugar factories. In 1912–13 the number of women employed had been reduced to 1,614 and the children to 936. The average number of people employed during the period 1893–94 to 1902–3 was 48,468, with an average production of sugar per employee of 17.48 tons. During the 10 years 1903–4 to 1912–13 the number of employees decreased to 37,782, but the production of sugar per employee increased to 20.61 tons.

The production of sugar per ton of beets in 1893–94 to 1902–3 averaged 235 pounds, which increased to 243 pounds during the 10 years 1903–4 to 1912–13. The per cent of sugar extracted per weight of beets increased slightly during the 20 years. The percentage of extraction was 11.8 per cent during the 10 years 1893–94 to 1902–3 and 12 per cent during the 10 years 1903–4 to 1912–13.

The beet pulp sold during the last 10 years was valued at an average of about 75 cents per ton, the range being from 70 to 81 cents. The average wages paid per day during the last 10 years were 82 cents for men, 45 cents for women, and 34 cents for children.

The coal used during the 10 years 1903–4 to 1912–13 averaged 781,944 tons annually, at an average price per ton of $4.26.

Subsequent to 1886 the exports of sugar have exceeded the imports, except in the years 1911 and 1912, when the imports were in excess of the exports. The exports have shown a marked decline during the 10 years 1904–1913 compared with the preceding 10 years, 1894–1903. On the other hand, the imports have increased during the last 10 years as compared with the 10 years preceding. The average annual exports during the period 1894–1903 were 414,079 tons, compared with 262,763 tons during the period 1904–1913. The imports during 1894–1903 averaged 135,048 tons annually, and 146,814 tons during 1904–1913. The greater portion of the sugar exported was refined, and the most of the imports were raw sugar from French colonies.

The annual average consumption of sugar in France during the 10 years 1893–1902 was 480,967 tons, or 24.9 pounds per capita. The consumption during 1903–1912 was 662,438 tons annually, or 30.6 pounds per capita. The range of per capita consumption during the first 10 years was from 22.9 to 26.7 pounds and during the last 10 years from 30 to 38.6 pounds.

Statistics of beets grown for seed are available only for the Department of the Nord. The data given are for 1913 and 1914, and the area devoted to this purpose was 1,221 and 1,831 acres, respectively. The production of seed was 1,960,330 and 3,593,939 pounds, valued at 10.6 and 7.5 cents per pound, or a total of $205,939 and $267,434. The average yield per acre was 1,605 and 1,963 pounds, or an average value per acre of $160.55 and $146.06.

The sugar section of France is in the extreme northern part, composed chiefly of five Departments—Nord, Aisne, Oise, Somme, and Pas-de-Calais. These five Departments contain 180 of the 232 sugar factories, leaving only 52 for all of the other Departments.

ITALY.

BEET SUGAR.

The sugar-beet area of Italy is located in the northeastern part of the Kingdom, chiefly in two Provinces, Venetia and Emilia, bordering on the northern part of the Adriatic Sea. The Province of Venetia contained one-half of the area devoted to sugar beets, and Emilia about one-third. These two Provinces produced approximately 90 per cent of the beets during the six years 1909–1914. They also contain

26 of the 37 factories. The total area of Italy under cultivation aggregated 50,000,000 acres, of which less than three-tenths of 1 per cent was utilized for the growing of sugar beets, yet the production of sugar practically supplied the home demand in 1903 and subsequently. The area devoted to beets in 1906 was 93,784 acres, which increased to 152,709 acres in 1913. The production of beets increased from 1,128,118 tons in 1906 to 1,850,839 in 1910 and to 3,009,279 in 1913. The yield of beets per acre has been equal to and in some years has exceeded the larger and older beet-growing countries of Europe. The yield of 12.03 tons per acre in 1906 was increased to 14.92 in 1910 and to 19.70 in 1913. Data for beets used for sugar are not available prior to the campaign of 1906–7. The quantity used that year was 1,057,489 tons, which increased to 1,698,551 in 1910–11 and to 2,994,816 in 1913–14. The average annual production of beets for the five years 1909–1913 was 1,982,634 tons, of which 93.4 per cent, or 1,852,097 tons, were used for making sugar. The annual production of sugar during that period was 208,675 tons, or 11.27 per cent of the weight of the beets.

The beet-sugar factories increased from 34 in 1903–4 to 37 in 1913–14. The production of sugar has more than doubled during the last decade, amounting to 144,248 tons in 1903–4 and to 336,823 in 1913–14. The average annual production of sugar during the decade ending with 1912–13 was 149,009 tons, compared with 29,870 for the preceding decade, an increase of approximately 400 per cent. The production of sugar per acre of beets was increased from 2,500 pounds in 1906–7 to 4,400 pounds in 1913–14. The production of sugar per ton of beets used shows a much smaller increase, the production being 222 pounds in 1906–7 and 233 in 1912–13. The average length of the sugar campaign was given as about 75 days. During the sugar campaign the average production of sugar per factory was 3,665 tons in 1906–7, which increased to 9,103 tons in 1913–14. The exports of sugar from Italy have been practically nil and the imports since 1900 have been small. The largest quantity imported during any one year since 1900 was 26,166 tons in 1906, and the smallest quantity was 2,464 tons in 1903. The imports of sugar decreased from 89,259 tons in 1893 to 7,723 tons in 1912. The average annual imports for the decade ending with 1902 was 69,414 tons, as against 10,187 tons for the decade ending with 1912.

The per capita consumption of sugar in Italy as compared with other countries is among the smallest of any of the civilized nations. The official figures are shown only by five-year periods. Beginning with 1891–1895 the per capita consumption was 5.2 pounds, 8.6 pounds during 1906–1910, and 9.7 pounds during 1909–1913. The total consumption of sugar has increased from 88,566 tons annually for the

decade ending with 1902, as compared with 141,104 for the decade ending with 1912. During the latter decade the domestic sugar supplied more than 90 per cent of the consumption, compared with 30 per cent for the preceding decade. The small amount of sugar consumed is probably due to the high retail price of from 12 to 17 cents per pound. The import duty is from 8 to 10 cents per pound, and an excise or internal revenue tax of nearly equal amount is levied on all domestic sugars. The excise tax is not imposed on imported sugar, but an octroi or municipal tax of from 1 to 2 cents per pound is levied on all sugar shipped from one city to another by the city of final destination. Italy exports large quantities of candied fruits, but the sugar and sirups necessary for their preparation are imported in bond, on which no tax is levied, and shipped out again in the form of confectionery and sweetmeats.

BELGIUM.

BEET SUGAR.

Sugar beets are grown in each of the nine Provinces of Belgium. The principal beet section is through the center from east to west and embraces the three Provinces of Brabant, Hainaut, and Liege. These Provinces contain about two-thirds of the area devoted to this crop. During the period 1903–4 to 1913–14 the total cultivated area of Belgium aggregated 4,400,000 acres, of which an annual average of 138,113 acres, or 3 per cent, was devoted to the growing of sugar beets. The year of smallest area, 109,470 acres, was followed by the year of largest area, 158,576 acres. During the period 1900 to 1913 there was not much increase in the area of beets. The annual average increased from 136,450 acres during the five years 1900–1904 to 144,164 acres during the five years 1909–1913. The production of beets shows a decrease from 1,856,454 tons to 1,770,361, and the yield of beets per acre also shows a decrease from 13.44 tons to 12.26 for the two periods, respectively. The production of beets per acre decreased from 15.31 tons in 1900 to 11.85 in 1913. The average for the 11 years ending with 1913 was 12.67 tons per acre.

The beet-sugar factories decreased from 113 in 1903–4 to 84 in 1913–14, while the production of sugar increased from 209,476 tons in 1903–4 to 249,395 in 1913–14. The smallest production of sugar for any year during the 11 years ending with 1913–14 was 184,706 tons in 1904–5, which was followed by the year of largest production, amounting to 345,905 tons. The annual average for the 11 years was 268,175 tons, or an average per factory of 2,765 tons. The beet factories in Belgium produce mostly raw sugar, which is sent to the refineries for further treatment. The refineries decreased from 26 in 1903–4 to 22 in 1912–13. The sugar extraction per weight of beets

increased from 13.03 per cent in 1903–4 to 16.25 per cent in 1913–14, with an average extraction for the period of 15.26 per cent. In 1912–13, 2,944 analyses of the sugar content of beets were made. In these tests the percentage of sugar per weight of beets ranged from 12.6 per cent to 19.6, with an average of 16.9. The per cent of sugar extraction for Belgium, while lower than that of Germany for the last 10 years, was higher for a portion of the period and showed a more gradual increase. The highest percentage of extraction for Belgium was 16.25 per cent in 1913–14, compared with 16.77 per cent for Germany in 1908–9. The production of sugar per ton of beets increased from 261 pounds in 1903–4 to 325 pounds in 1913–14, or an average of 300 pounds for the 11 years. The production of sugar per acre increased from 3,144 pounds in 1903–4 to 3,851 pounds in 1913–14, or an average of 3,796 pounds during the period.

The consumption of sugar has increased during the last 11 years from 77,164 tons in 1903–4 to 127,354 tons in 1913–14, or an average of 102,308 tons, which was 38 per cent of the production for the same period. The per capita consumption increased from 22.3 pounds to 33.3 pounds, or an annual average of 28.1 pounds for the 11 years. The imports have been small, averaging only 8,552 tons for the 11 years ending with 1913, as compared with 166,215 tons for exports. The greater part of the sugar produced has been exported, amounting to nearly two-thirds of the production. The sirup produced by the refineries averaged 3,051 tons and was valued at $44,352.

NETHERLANDS.

BEET SUGAR.

The sugar-beet area of the Netherlands is located chiefly in the southwestern part, near the Belgian border. Approximately one-third of the area under beets was located in Zeeland and one-sixth in each of the Provinces of South Holland and North Brabant. The total area under cultivation increased from 1,505,000 acres in 1904 to 2,305,000 in 1913. Of this area slightly more than 5 per cent was devoted to the growing of sugar beets. The area under beets increased from 84,780 acres in 1904 to 160,180 acres in 1912, or an increase in proportion to the total area under cultivation of 1 per cent. The area of sugar beets for the decade ending with 1913 had an annual average of 125,403 acres, compared with 101,567 for the preceding decade, or an increase of nearly 24,000 acres. The average annual production of beets for the latter decade was 1,743,659 tons, compared with 1,403,546 for the preceding decade, or an increase of 340,000 tons. The yield of beets per acre during the decade ending with 1913 was lowest, 12.13 tons, in 1909, and highest, 16.06 tons, in 1911, or an annual average for the decade of 13.89 tons, compared with 13.58 for the preceding decade. The average annual value of

beets per ton increased from $3.46 for the 10 years ending with 1903 to $4.26 for the decade 1904–1913. The sugar content of beets was highest in 1908–9, 16.8 per cent of the weight of the beets, and lowest in 1905–6, 15.5 per cent. The factories increased from 28 in 1904–5 to 31 in 1913–14. The beets used for sugar increased from 965,533 tons in 1904–5 to 2,228,851 tons in 1912–13. The raw sugar produced increased from 150,974 tons in 1904–5 to 329,499 in 1912–13. The quality of the beets grown in the Netherlands is equal to any grown on the Continent. The sugar produced per ton of beets ranged from 273 to 313 pounds for 1904–5 and 1913–14, respectively. The production of sugar per acre ranged from 3,500 to more than 4,000 pounds. The production of sugar per factory in 1904–5 was 5,392 tons, which was doubled in 1912–13, amounting to 10,983 tons. The beet pulp sold was valued at 87 cents per ton in 1904–5, and $1 per ton in 1912–13. The sugar consumed has been about one-third of the production. The average annual per capita consumption during the five years 1902–1906 was 29.85 pounds, compared with 32.52 pounds for the five years 1907–1911. For a number of years the Netherlands has been a large exporter of sugar, and during the decade ending with 1913 the average annual exports were 181,317 tons, or approximately three-fourths of the production.

Compared with other crops in 1912, sugar beets exceeded the area devoted to wheat and barley, but were exceeded in area by rye, oats, and potatoes. The farm value of sugar beets produced that year was $11,372,000, compared with $26,000,000 for potatoes, $22,000,000 for rye, and $13,000,000 for oats. The average value per acre was sugar beets $71, potatoes $61, wheat $57, barley $53, rye and oats each $40.

SPAIN.

BEET SUGAR.

Spain is the only country in Europe that produces both beet and cane sugar in commercial quantities. Its beet-sugar industry has been developed within the last quarter of a century and in 1912 occupied 12 times the area devoted to cane and the production of beet sugar was more than 10 times that of cane. The soil and climatic conditions are better adapted to the growing of sugar beets and the beets are grown in nearly all parts of the kingdom, while the growing of cane is confined to a restricted area. Sugar beets are grown in 19 of the 30 Provinces, while cane is grown only in 3 Provinces. Most of the beets have, in recent years, been grown in the north-central Provinces, yet the Province of Granada, in the extreme southern part, that was second in production of beets and beet sugar in 1912–13, was also second in the production of cane and cane sugar. This Province contained one-third (or 15) of the beet-sugar factories

in 1912 and 1913 and nearly one-half (or 15) of the cane-sugar factories. The area under cultivation in Spain in 1911 was 41,000,000 acres, of which approximately three-tenths of 1 per cent was used for sugar beets. The statistics for production of beets are available for only one year, 1912, and was 1,452,991 tons, of which 1,302,871, or 89.7 per cent, was used for sugar. The yield of beets per acre that year was 9.9 tons and was sold at a price varying from $5.70 to $6.70 per ton, or a total farm value exceeding $9,000,000.

The number of beet-sugar factories has decreased from 55 in 1905–6 to 45 in 1913–14, of which 25 were idle in 1905–6 and 19 in 1913–14. The beet-sugar industry in Spain and the United States was placed on a paying basis about the same time and the growth of the industry has made rapid progress in both countries, but much more rapid in the United States than in Spain. The production of beet sugar during the five years 1909–1913 as compared with 1899–1903 shows a gain of 77.3 per cent for Spain and 320.7 per cent for the United States. The beets used for sugar in Spain increased from 11,790 tons in 1896–97 to 1,478,114 tons in 1913–14, and the sugar produced increased from 920 tons to 186,680 for the same years. The average annual quantity of beets used for sugar during the decade 1903–4 to 1912–13 was 865,070 tons, with an average production of 102,777 tons of sugar. The quantity used for sugar varied from 929,787 tons in 1903–4 to 1,302,871 in 1912–13, and the production of sugar for the same years varied from 104,947 to 171,839 tons. The percentage of sugar extraction per weight of beets increased from 11.28 per cent in 1903–4 to 12.92 in 1909–10, but decreased to 11.33 in 1912–13, or an average for the decade of 11.67 per cent. Comparing the 5 sugar campaigns 1899–1900 to 1903–4 with the campaigns of 1909–10 to 1913–1914, an important increase is shown in sugar extraction. The sugar produced during the latter period increased 77.3 per cent over the former period, as against 36.7 per cent for beets used for sugar. The average per cent of extraction during the first period was 9.73 and 11.94 during the second period, an increase of 22.7 per cent. The average production of sugar per ton of beets during the five years 1899–1900 to 1903–4 was 196 pounds, as against 254 pounds for the five years 1909–10 to 1913–14, an increase of 29.6 per cent. During the campaign 1913–14 the factory producing the largest quantity of sugar was located in Zaragoza. This factory used 130,528 tons of beets and produced 18,419 tons of sugar. The average daily consumption of beets by this factory was 1,346 tons, from which 190 tons of sugar were produced. The harvesting of beets and manufacture of sugar in Spain begins in August and ends the following February, a season of approximately 200 days. The average length of the sugar campaign for all factories was 72 days in 1912–13 and 79 in 1913–14.

CANE SUGAR.

The cane-sugar industry in Spain is an old one and has been localized for a number of years in the three Provinces of Almeria, Granada, and Malaga. The growing of cane is confined to a small area, and occupied 11,666 acres in 1910, 9,983 in 1911, 9,844 in 1912, and 4,581 in 1913. The production of cane decreased from 258,137 tons in 1910 to 167,092 in 1911, 153,707 in 1912, and 79,719 in 1913. The average production of cane per acre was 21.9 tons in 1910, 16.5 in 1911, 15.6 in 1912, and 17.4 in 1913. The cane-sugar industry has been less profitable than the beet-sugar industry, and the quantity of cane used for sugar during the last 15 years has decreased, while the quantity of beets used has increased. The cane crushed during the three years 1899–1900 to 1902–3 averaged 320,504 tons, compared with 133,506 tons for the three years 1911–12 to 1913–14. The production of sugar decreased from 28,962 tons to 13,566 tons, respectively, for the two periods just mentioned. The production of sugar per ton of cane for these two periods increased from 178 pounds in the first period to 202 pounds in the second period. During the decade 1903–4 to 1912–13 the cane used decreased from 287,735 tons in 1903–4 to 153,707 tons in 1912–13, or an average of 226,394 for the decade. The production of sugar decreased from 24,444 tons in 1903–4 to 14,585 in 1912–13, or an average for the decade of 20,783 tons. The average production of sugar per ton of cane for the decade was 184 pounds, and exceeded 200 pounds for the years 1907–8, 1909–10, and 1911–12. The percentage of sugar extracted per weight of cane increased from 8.49 per cent in 1903–4 to 9.48 per cent in 1912–13, or an average of 9.43 per cent for the decade ending with 1912–13. The season for making cane sugar extends over a period of approximately 200 days, beginning in December and ending in June. However, the average days in actual operation for all factories was 56 in 1912–13 and 49 in 1913–14.

During the decade 1903–4 to 1913–14 there was an average of 22 cane-sugar factories of modern equipment and 13 trapiches, or small mills, using the open-kettle process for making sugar. Of the 22 factories, an average of 17 were in operation and 5 were idle. Of the 13 trapiches in existence, 9 were in operation and 4 were idle. The beet factories made a poorer showing than the cane factories, for the number decreased from 55 in 1903–4 to 45 in 1913–14, or an average of 50 for the decade. Of the 50 factories, only 32, or 64 per cent, were in operation, while 18, or 36 per cent, were idle. The sugar industry in Spain for the last 15 years has been in a more or less unsatisfactory condition owing to overproduction and the low prices as compared with the cost of production. The loss of the Spanish colonies in 1898 checked the imports of sugar and stimulated domestic

production. The outlook for the home industry was promising and capital was invested in new factories, which increased from 26 in 1898 to 48 in 1901, 79 in 1903, and 88 in 1904. The increase in number of factories resulted in such a large overproduction of sugar that in 1903 a company was formed known as the "Sociedad Azucarera Espanola." This company operated 60 per cent of the sugar factories and was organized for the purpose of limiting the output of sugar and maintaining prices above cost of production. This company included 11 of the cane and 42 of the beet factories in 1904, a total of 53. The independent factories were cane 10, trapiches 12, and beet 13, a total of 35, or 40 per cent of the total number of factories. The associated factories gradually decreased to 37 in 1913, while the independent factories increased to 42, or 53 per cent of all factories. The organization of this sugar association did not entirely relieve the situation. The rivalry that sprang up between the two classes of factories resulted in an annual overproduction, with a consequent lowering of prices, and the stock of 89,580 tons of sugar on hand on December 31, 1904, was increased to 158,310 tons on December 31, 1914. The independent factories had a higher percentage of sugar extraction than the associated factories during the decade ending with 1912–13. For this period the average extraction per weight of cane or beets for the independent factories was 9.23 per cent for cane, and 12 per cent for beet, as against 9.11 for cane and 11.57 for beets for the associated factories.

SUGAR SUPPLY.

Prior to 1900 the principal source of the Spanish sugar supply was Spain's colonial possessions of Cuba, Porto Rico, and the Philippine Islands. Approximately two-thirds came from Cuba, very little, amounting to less than 2,000 tons, coming from foreign countries. The annual imports from all sources for the decade 1883–1892 were 62,660 tons, of which 39,505 tons came from Cuba. During the next decade, 1893–1902, the annual imports of sugar decreased to 21,977 tons, of which 9,991 tons came from Cuba. During the decade 1903–12 the annual imports decreased to 49 tons. The imports began to decrease in 1893, when the sugar-beet industry began to develop, and as this industry expanded the imports decreased. Prior to 1893 the colonies were the principal source of the sugar supply; for the next 10 years the domestic production slightly exceeded the imports, and from 1903 to 1912 practically no sugar was imported. The exports have been in negligible quantities, amounting to an average of only 59 tons for the decade 1893–1902, as against 711 tons for the decade 1903–1912. The exports in 1913 exceeded all previous years, amounting to 5,736 tons. The consumption of sugar in Spain in-

creased from 97,266 tons in 1903–4 to 147,204 tons in 1912–13, or an average of 119,780 tons for the decade. The per capita consumption during this period was approximately 12 pounds. The consumption of sugar during the five years 1909–1913 as compared with the five years 1900–1904 shows an increase of 41.3 per cent, as against an increase of 49.6 per cent in production for the same period.

DENMARK.

BEET SUGAR.

The area of land in Denmark devoted to the growing of sugar beets is located chiefly in the islands southeast of the mainland. These islands have annually produced about 97 per cent of the sugar beets, and contain also all of the factories. The total area under cultivation in 1907 was 6,376,000 acres, which increased slightly to 6,644,000 acres in 1912. Of this area, sugar beets occupied 0.6 per cent, or 39,568 acres, in 1907, and 1.2 per cent, or 79,986 acres, in 1912. While the area devoted to the growing of beets has increased 100 per cent since 1907, the production of beets has increased 200 per cent since 1904. The production that year was 393,011 tons, which increased to 1,159,369 in 1912. The annual average for the decade ending with 1913 was 671,540 tons. The production of beets per acre increased from 11.32 tons in 1907 to 14.49 in 1912. The area and farm value of sugar beets, while much less than that of other crops, has shown a greater increase than any of the other principal crops. The value of beets increased more than 122 per cent during the decade ending with 1912, while the value of all crops, including beets, increased only 64 per cent. The beets were valued at $1,569,000 in 1903 and $3,484,000 in 1912, while the value of all crops for the two years, respectively, was $112,273,000 and $184,170,000. The value of wheat decreased from $3,351,000 in 1903 to $3,296,000 in 1912. The increases in other crops for the two years, respectively, were rye $12,503,000 to $14,954,000, barley $14,782,000 to $19,564,000, oats $19,014,000 to $23,638,000, potatoes $3,994,000 to $6,110,000. The farm value of beets per ton ranged from $3.16 in 1910 to $4.42 the following year.

The beet-sugar factories increased from 7 to 9 during the decade 1904–1913. Two new factories were recently erected, one in 1910, the other in 1912. The output of sugar varied from 48,639 tons in 1904 to 179,002 in 1913, or an annual average for the decade of 95,983 tons. The production in 1914 decreased to 167,803 tons. The production of sugar per acre increased from 2,934 tons in 1907 to 3,712 tons in 1912, and the production per factory increased from 6,948 tons in 1904 to 19,889 tons in 1913. The sugar extraction per ton of beets increased from 248 pounds in 1904 to 349 pounds in

1913, an increase of 40 per cent. Denmark has never produced enough sugar to supply domestic requirements but is rapidly approaching that condition. During the five-year period 1876–1880 only 4 per cent of the sugar consumed was of domestic origin; this was increased to 63 per cent during the five years 1896–1900 and to 90 per cent in 1914. The consumption of domestic sugar increased from 1,080 tons in 1876–1880 to 116,193 tons in 1914, while the total consumption increased from 28,792 tons to 129,807 for the same period. The per capita consumption increased from 29.72 pounds in 1876–1880 to 90.81 pounds in 1914, an increase of 200 per cent. The average annual consumption of sugar during the decade 1904–1913 was 106,375 tons, or 110.8 per cent of the production; the imports averaged 27,959 tons, or 29.1 per cent of the production. The imports decreased from 41,501 tons in 1904 to 13,444 tons in 1913, while the exports increased from 13 tons to 50,534 for the same period.

SWEDEN.

BEET SUGAR.

The territory of Sweden used for growing sugar beets is in the extreme southern part, chiefly in Provinces along the coast. The Province of Malmöhus, which exceeded all other Provinces combined in production of beets in 1913 and 1914, produced 579,153 tons of beets, or 62.2 per cent of the total, in 1913, and 647,178 tons of beets, or 66.9 per cent, in 1914. The Province of second importance in the production of beets for these two years was Kristianstad, and the third in importance was the island of Gottland. The total area under cultivation in Sweden in 1911 was 9,200,000 acres, of which 71,790 acres, or 0.8 per cent, was used for sugar beets. The area used for beets decreased from 79,257 acres in 1908 to 66,900 in 1912, but increased to 79,700 in 1914. The annual average for the five years 1906–1910 was 80,723 acres. The production of beets has more than doubled during the last 20 years, and increased from 453,245 tons in 1893 to 924,164 in 1901, but decreased to 670,120 the following year and increased to 933,067 in 1912 and to 966,998 in 1914. The average production of beets for the five years 1891–1895 was 466,445 tons, which increased to 749,973 for 1896–1900, 768,995 for 1901–1905, and 1,053,947 for 1906–1910. The average yield per acre increased from 13.04 tons in 1908 to 14.83 in 1911, but decreased to 13.95 in 1912 and to 12.13 in 1914. The annual farm value of the beet crop increased from $2,037,000 for the five years 1891–1895 to $3,725,000 for 1901–1905 and to $6,378,000 for 1906–1910. The value in 1909 was $6,325,000, which decreased to $5,241,000 in 1914. The average price paid for beets in 1913 was $5.59, which decreased to $5.42 per ton in 1914.

The number of beet-sugar factories in Sweden increased from 13 for the five years 1891–1895 to 19 for 1896–1900, to 21 for 1901–1905, to 23 for 1906–1910, and to 24 for the five years ending with 1913. The beets used for sugar increased from 458,261 tons for the five years 1891–1895 to 790,409 for 1896–1900 and to 1,036,929 for 1906–1910. The annual production of sugar by five-year periods increased from 51,794 tons in 1891–1895 to 112,750 in 1901–1905 and to 156,688 in 1906–1910. The production of sugar per ton of beets increased from 212 pounds for the five years 1891–1895 to 302 for 1906–1910 and to 316 for 1912–13. The sugar extraction per weight of beets shows a gradual increase from 10.93 per cent for the five years 1891–1895 to 14.94 for 1906–1910 and to 15.59 for 1912–13, an increase during the latter year of 42.5 per cent over the five years 1891–1895.

The five years 1906–1910 compared with the five years 1891–1895 show an increase of 126 per cent in both beets produced and beets used for sugar. For these two periods the production of sugar increased 202.5 per cent and the number of factories increased 76.9 per cent. During each of these periods more than 98 per cent of the beets produced were used for sugar. For these two periods the production of molasses in the beet factories increased from 12,896 tons to 13,492 tons. The sugar produced per acre averaged 3,882 pounds for the five years 1906–1910, which increased to 4,349 pounds for the year 1912–13. From 1906–7 to 1912–13 there were 10 sugar refineries in operation which refined both domestic and imported raw sugar. During the five years 1906–7 to 1910–11 these refineries used 141,806 tons of raw sugar, from which was obtained 133,376 tons of refined sugar, 1,268 tons of sirup, and 7,390 tons of molasses. The per capita consumption of sugar was 30.1 pounds for the five years 1891–1895 and 57.8 pounds for the five years 1906–1910, an increase of 92 per cent. The exports of sugar decreased from 300 tons in 1911 to 1 ton in 1912, but increased to 12,646 tons in 1914. The imports of sugar were 47 tons in 1911, which decreased to 16 tons in 1914.

ROUMANIA.

BEET SUGAR.

The sugar-beet area of Roumania lies chiefly in the northern part, in the Province of Moldavia, and forms a connecting link between the sugar-beet districts of Hungary on the west and Russia on the east. In 1907–8 and subsequently there were five sugar factories in operation in Roumania, of which four were in Moldavia and one in Wallachia, near Bucharest. The Province of Moldavia produced 84.89 per cent of the beets in 1909, of which 51.93 were produced in the valleys of the Sereth and Pruth Rivers and 32.96 in the plains of the Carpathian Mountains. The annual area under cultivation dur-

ing the decade 1903–1912 was 14,800,000 acres, of which 27,577 acres, or 0.2 per cent, were under beets. The area used for beets increased from 22,039 acres in 1903 to 36,534 in 1913, or an average for the decade 1903–1912 of 27,577 acres. The five-year period 1908–1912 compared with the five years 1903–1907 shows an increase of 42.7 per cent in area of beets, as against an increase of 63.1 per cent in quantity of beets produced. The production of beets was 159,935 tons in 1903, which increased to 311,250 in 1912, or an average of 247,976 for the decade. The yield of beets per acre increased from 7.24 tons in 1903 to 10.32 in 1909, but decreased to 9.68 in 1912, and the average for the decade was 8.56 tons. During the eleven years 1903–1913 the yield of beets per acre was lowest in 1913 and amounted to only 6.79 tons. The area that year was 36,534 acres, the largest of the entire period, but the production of beets, 247,976 tons, was the lowest since 1908. The farm value of beets was $805,000 in 1907, which increased to double that amount, $1,665,000, in 1909, but decreased to $1,303,000 in 1913. The value of the beets per ton increased from $4.38 in 1907 to $5.25 in 1913. The average value of the beet crop per acre was $36.13 in 1908, $50.60 in 1910, $48.30 in 1913, and $35.65 in 1914. The beets produced formed 0.44 per cent of the value of all agricultural products in 1908, 0.66 per cent in 1910, 0.47 per cent in 1911, and 0.53 per cent in 1914.

The production of sugar in Roumania began in the early eighties. Figures for 1886 show a production of only 671 tons for that year. Ten years later the quantity produced was 1,884 tons. In 1899–1900 the production amounted to 14,713 tons, which increased to more than twice that amount in 1902–3, again doubled in 1910–11, amounting to 55,118 tons, but a decline to 35,887 tons is shown for 1911–12. The output of sugar for the five-year period 1899–1900 to 1903–4 was 29,752 tons, as against 39,071 tons for the five years 1907–8 to 1911–12, an increase of 31.3 per cent. The figures of production as just stated do not represent the actual production for each year, as the stock of sugar on hand at the close of the sugar year is included in the production of the following year.

The consumption of sugar during the 13 years 1899–1900 to 1911–12 has nearly doubled and amounted to two-thirds of the production. The consumption in 1898–99 was 23,531 tons; in 1906–7, 28,992 tons; in 1912–13, 38,525 tons. The consumption during the five years 1899–1900 to 1903–4 was 19,083 tons, as against 31,916 tons for the five years 1907–8 to 1911–12, an increase of 67.2 per cent, while the production for the same period increased only 31.3 per cent. The domestic production of sugar in Roumania has been about equal to the domestic requirements. Small quantities of sugar have been exported, but almost an equal amount has been imported. The annual exports for the decade 1903–4 to 1912–13 were 2,177 tons, while the

imports amounted to 308 tons. The exports varied from 4 tons in 1908–9 to 6,359 in 1910–11, and the imports varied from 175 tons in 1907–8 to 887 in 1912–13.

SWITZERLAND.

BEET SUGAR.

The area used for growing sugar beets in Switzerland is located in the western part, mostly in the canton of Berne, but for some years beets were grown also in the canton of Vaud. With the exception of the four years 1893 to 1896 the data for production and value of beets are for the canton of Berne. In 1904 the area under beets in Berne was 1,148 acres, which decreased to 1,025 acres in 1910. The annual production of beets was 7,656 tons for the decade 1893–1902, and 11,930 tons for the decade 1903–1912, an increase of 58.9 per cent. The production of beets in Vaud was 1,958 tons in 1893, 6,656 in 1894, and 11 in 1896. For Berne the production of beets increased from 37 tons in 1895 to 20,221 in 1901, decreased to 16,130 in 1905, and increased to 20,772 in 1913. The value of beets produced in Vaud was $8,570 in 1893, $30,301 in 1894, and $40 in 1896. The beets produced in Berne were valued at $253 in 1895, $74,350 in 1901, $63,133 in 1905, and $79,531 in 1913. The annual value of beets produced was $29,300 for the decade 1893–1902 and $49,857 for the following decade, an increase of 70.1 per cent, as against 58.9 per cent for production of beets. The annual value of beets per ton was $3.83 for the decade 1893–1902, as compared with $4.18 for the decade 1903–1912. The yield of beets per acre was 12.96 tons in 1904, with a value per acre of $51.94. In 1910 the yield was 11.04 tons, which was valued at $47.91.

The only sugar factory in Switzerland is located at Aarberg, in the canton of Berne, and produces only refined sugar. The output of this factory averaged 3,631 tons for the six years 1906–7 to 1911–12. The output of sugar varied from 4,012 tons in 1906–7 to 4,032 in 1908–9 and 2,976 in 1910–11. The factory was destroyed by fire in January, 1912, but was rebuilt and resumed operations in 1913–14. This factory employs 400 people and the wages paid monthly approximate $10,000.

Very little if any sugar has been exported from Switzerland, but the imports have increased from 87,710 tons in 1904 to 134,145 in 1912, decreased to 129,257 in 1913, or an average of 107,203 for the decade. The imports of sugar for the five years 1906–1910 were 101,897 tons, compared with 89,915 for the five years 1901–1905, an increase of 13.3 per cent.

The per capita consumption of sugar in Switzerland is larger than for most of the other European countries and amounted to 61.5

pounds in 1910. The total consumption of sugar for that year was 115,529 tons. A large quantity of the sugar consumed in Switzerland is used in the confectionery, condensed milk, and chocolate industries, and is afterwards exported. The exports of these products in 1913 were 44,708 tons for condensed milk, 18,538 for chocolate, and 1,658 for confectionery.

BRITISH INDIA.

CANE SUGAR.

The area of British India used for sugar cane is in the northern part, in the valleys of the Ganges and Indus Rivers. The United Provinces of Agra and Oudh contain one-half of the area under cane and produce one-half of the sugar. The Provinces of Punjab, Bihar, and Bengal contain the greater portion of the remainder of the area under cane. Cane is also grown in the Provinces of Bombay in the west and Madras in the south. The sugar-cane areas of India are like those of the United States in the sense that they lie mostly outside of the tropics and are subject to frost. Sugar cane is a tropical plant and thrives best in a uniformly warm climate where there is an abundance of water supply and in an alluvial soil retentive of moisture. These conditions exist in the valleys of the Ganges and Indus Rivers, with their numerous irrigation canals. In the south, where climatic conditions are better suited to this crop, the other physical conditions are less favorable. In this way the sugar-cane cultivation of India has been driven from the tropics and thrust northward close to the limit of cane cultivation. These conditions, together with the backward methods of cultivation and manufacture of sugar, are chiefly responsible for the low yield of sugar per acre in India. The estimated yield of cane per acre on the best land is 20 tons, but the primitive methods of extracting the sugar leave about one-half of the sugar in the cane. The fields are widely scattered and so far apart that the cost of transportation from field to factory forbids the large central sugar factory as used in other sugar-cane countries.

The total area under cultivation in India during the decade 1903–4 to 1912–13 was 257,000,000 acres, of which 2,279,859, or a little less than 1 per cent, was used for cane. Nearly one year is required for cane to mature in India. It is planted in February, March, and April and harvested in December and January. The average yield of sugar per acre has been about 1 ton, but slightly exceeded that figure in recent years, and amounted to 2,290 pounds in 1912–13 and to 2,011 in 1913–14. The cane grown in the United Provinces yields from 1,500 to 3,200 pounds of raw sugar (gur) per acre. The yield of sugar per acre varies considerably in the other Province, from

1,904 pounds (17 hundredweight) for Assam, 2,464 pounds (22 hundredweight) for Bengal, 2,688 pounds (24 hundredweight) for Eastern Bengal, to 5,040 pounds (45 hundredweight) for Madras. The total production of raw sugar for all Provinces increased from 2,096,624 tons in 1903–4 to 2,893,632 in 1912–13, decreased to 2,534,112 in 1913–14 and increased to 2,952,320 in 1915–16. The average for the decade 1903–4 to 1912–13 was 2,382,371 tons.

There are only about 20 modern factories in India and they are small. This class of factory increased from 20 in 1903–4 to 26 in 1912–13, or an average of 23 for the decade. Most of these factories are refineries, in which raw sugar prepared by the natives (rab or guŕ) is purified. The number of employees for the factories given varied from 4,018 in 1903–4 to 7,870 in 1912–13, or an average of 5,363 for the decade. The average number of employees per factory for the decade was 233.

The production of sugar in British India, while in excess of other countries, has fallen short of domestic requirements, as an average of 604,193 tons annually were imported during the 10 years 1904–1913. The imports increased from 388,023 tons in 1904 to 961,005 in 1913, and decreased to 605,884 in 1914. The exports increased from 25,409 tons in 1904 to 40,227 in 1912, but decreased to 21,604 in 1914. The annual average for the decade 1904–1913 was 25,839 tons for domestic exports and 177,755 for foreign exports, or a total of 203,594 tons exported. The consumption of sugar for the decade 1904–1913 was 2,585,965 tons, or an average per capita consumption of 16.7 pounds. Large quantities of cane are eaten raw as a delicacy by the natives, and for this purpose a special variety is grown, containing less sugar but having a softer fiber. The sugar consumed by the natives is raw sugar (guŕ) and is prepared for market by being poured into small holes scooped out in the ground or molded into balls or cakes by hand. Very little refined sugar is used.

JAVA, DUTCH EAST INDIES.

CANE SUGAR.

The growing of sugar cane in the Dutch East Indies is practically confined to the Island of Java. The total area under cultivation in Java and Madura in 1911 was 12,800,000 acres, of which 405,000 acres, or 3 per cent, was in sugar cane. Two other crops exceeded the sugar cane in area. They were rice, 5,883,000 acres, and tobacco, 421,000 acres. Cane is grown in all parts of Java, but the four Provinces of Soerabaja, Pasoeroean, Kediri, and Djokjakarta produced 60 per cent of the sugar in 1913. These Provinces also contained 107 of the 191 factories in operation that year. The harvest

season begins in May and ends in November. Cane for the sugar factories in Java is obtained from two sources, cane grown on land owned or controlled by the factory owners and cane grown by the natives. Statistics of area under cane grown by the natives are not available, but the cane purchased from the natives during the last 10 years slightly exceeded one-third the amount of factory-grown cane used for sugar. The area of cane cultivated by the factories increased from 255,905 acres in 1903–4 to 340,739 in 1912–13, or an average of 285,372 for the decade. The factory-grown cane used for sugar increased from 10,439,140 tons in 1903–4 to 15,370,765 in 1912–13, or an average of 12,459,284 for the decade. The cane purchased from the natives increased during the same period from 222,730 tons to 507,669, with an average of 454,150 for the decade. The sugar produced from factory-grown cane increased from 1,141,508 tons in 1903–4 to 1,527,584 in 1912–13, or an average for the decade of 1,296,437 tons. The sugar obtained from cane purchased from the natives during the same period increased from 18,358 tons to 50,748, or an average of 36,890 for the decade. During the last 10 years a decrease is shown in the proportion of sugar obtained from factory-grown cane compared with the purchased cane. Comparing the five-year period 1908–9 to 1912–13 with the five years 1903–4 to 1907–8, the factory cane used for sugar increased 28.1 per cent, while the production of sugar increased only 25.3 per cent. During the same periods the quantity of purchased cane used for sugar increased 17.3 per cent, but the sugar produced increased 41.0 per cent. The quantity of cane crushed per acre was 40.79 tons in 1903–4 and 45.11 tons in 1912–13, with an average of 43.66 tons for the decade. The highest for the decade was 46.43 tons in 1910–11, which exceeds all other countries; however, this is hardly a fair comparison, for the figures represent only the area cultivated or controlled by the factories and exclude the area cultivated by the natives. The yield per acre for the Territory of Hawaii in 1913 was 43 tons, which probably exceeds Java if the entire cane area of the latter island be considered.

The number of sugar factories in operation in 1903–4 was 184, which increased to 191 in 1912–13, or an average of 184 for the decade. The factories produced 1,159,866 tons of sugar in 1903–4, which increased to 1,578,332 in 1912–13, or an average of 1,333,326 for the decade. The production of sugar per factory increased from 6,304 tons in 1903–4 to 8,264 in 1912–13, or an average of 7,246 for the decade. The Hawaiian factories each produced an average of 11,900 tons of sugar in 1912, 10,900 in 1913, and 13,300 in 1914. The production of sugar per acre in Java from factory-grown cane increased from 8,917 pounds in 1903–4 to 8,966 in 1912–13. The highest yield per acre for the decade was 9,842 pounds in 1910–11, with an average of

9,086 pounds for the decade, compared with the Hawaiian production of 8,253 pounds per acre in 1898–99 and 11,400 in 1914–15. The extraction of sugar per ton of cane was much larger from factory-grown cane than from that purchased from the natives. The sugar extraction from a ton of factory-grown cane decreased from 219 pounds in 1903–4 to 199 pounds in 1912–13, or an average of 208 pounds for the decade, while the extraction from purchased cane increased from 165 pounds per ton of cane in 1903–4 to 200 in 1912–13, or an average of 162 pounds for the decade. This is considerably less than the extraction shown for Hawaii, which ranged from 230 pounds in 1898–99 to 250 pounds in 1913–14. The percentage of sugar extraction per weight of cane was 10.93 per cent in 1903–4, and 9.94 in 1912–13, with an average of 10.41 per cent for the decade. The extraction from the purchased cane ranged from 5.50 per cent in 1905–6 to 10 in 1912–13, the average for the decade being 8.12 per cent.

The sugar industry of Java has made remarkable progress during the last 30 years. The production of sugar increased from 360,723 tons in 1883 to 1,578,332 tons in 1913, an increase of nearly 400 per cent. The average annual production of sugar during the decade 1883–1892 was 435,066 tons, as against 722,174 tons for the decade 1893–1902, an increase of 66 per cent. The production during the decade 1904–1913 was 1,333,326 tons, which was an increase of 84.6 per cent over the preceding decade and an increase of 206.5 per cent over the decade 1883–1892. The average annual yield of cane per acre increased from 35.32 tons for the decade 1894–1903 and to 43.66 tons for the decade 1904–1913, an increase of 23.6 per cent. The average production of sugar per acre for these two decades, respectively, was 7,447 and 9,086 tons, an increase of 22 per cent.

The exports of sugar from Java in 1904 were 1,159,110 tons, which increased to 1,621,950 in 1913, or an average of 1,341,605 for the decade, an increase compared with the preceding decade of 81.4 per cent. During the decade 1893–1902, 97.3 per cent of the sugar produced was exported, as against 95.7 per cent for the decade 1903–1912. China, United States, United Kingdom, and British India have been the best markets for Java sugar. During the decade 1893–1902 approximately two-thirds of the sugar exported was consigned to the United States, United Kingdom, and China. During the decade 1903–1912 the exports to the United States and United Kingdom decreased, while the exports to China and British India increased to approximately one-half of the total exports. The imports have been small, ranging from 4,574 tons in 1907 to 3,728 in 1913. The consumption of raw sugar in Java increased from 13,268 tons in 1905 to 24,952 in 1913, or an average of 23,717 for the decade 1904–1913.

MAURITIUS.

CANE SUGAR.

During the last ten years the annual area used for cane and the production of sugar in Mauritius has exceeded that of any other British possession except British India. The area used for sugar cane in that island increased from 63,570 acres in 1893–94 to 83,935 in 1901–2, to 96,686 in 1908–9, and to 160,013 in 1913–14. The annual area under cane during the decade 1893–1902 was 74,383 acres, which increased to 109,964 acres during the decade 1903–1912, an increase of 47.8 per cent. The production of sugar in Mauritius increased from 78,993 tons in 1893–4 to 171,209 in 1902–3 and to 275,250 in 1913–14. The annual average for the decade 1903–4 to 1912–13 was 207,696 tons, as against 153,052 for the preceding decade. The increase in production of sugar during the last decade over the preceding one was 35.7 per cent, as compared with 47.8 per cent increase in area used for cane. The annual exports of sugar from Mauritius for the 15 years 1899–1913 were 204,671 tons, of which 26,089 tons, or 12.7 per cent, went to the United Kingdom. The exports to the United Kingdom increased from 8.1 per cent during the five years 1899–1903 to 19.2 per cent for the five years 1909–1913.

During the sugar campaign of 1913 there were 59 sugar factories in operation, and the average sugar extraction per weight of cane was 10.7 per cent. The 1913 crop of cane exceeded all previous years, and the factories were required to operate at their full capacity and worked from 18 to 20 hours per day.

JAPAN.

CANE SUGAR.

The territory upon which sugar cane is grown in Japan is limited to a small area in the southern part of Japan proper. The total area under cultivation in 1913 was 14,000,000 acres, of which 51,293 acres, or 0.4 per cent, was in sugar cane. The area under cane decreased from 46,338 acres in 1906 to 43,493 in 1909, but increased to 51,293 in 1913 and to 53,300 in 1914. The production of cane amounted to 851,130 tons in 1906, decreased to 610,195 in 1907, and increased to 946,348 in 1912 and to 954,758 in 1914. The yield of cane per acre was 18.37 tons in 1906, but fell to 13.69 tons in 1907 and increased to 17.15 and 17.91 tons, respectively, for 1913 and 1914. The number of sugar factories in operation has more than doubled during the last 10 years. There were 7 factories in 1904–5, which were increased to 16 in 1913–14. The cane used for sugar in 1906–7 amounted to 592,693 tons, or 97.1 per cent of the production. In 1911–12 the cane used amounted to 941,550 tons, or 99.4 per cent of the production. The production of sugar increased from 56,078 tons in 1906–7 to 75,797 in 1911–12, but decreased to 68,867 in 1912–13

and again increased to 72,613 in 1913–14. The production of sugar per acre increased from 2,517 pounds in 1906–7 to 2,685 in 1912–13 and to 2,725 in 1913–14. The production of sugar per ton of cane decreased from 189 pounds in 1906–7 to 161 pounds in 1911–12, and the percentage of sugar extraction per weight of cane for the same years was 9.46 and 8.05 per cent, respectively. The number of people employed in the sugar factories increased from 737 in 1904–5 to 1,187 in 1913–14, or an average of 1,156 for the decade, of which 1,028 were men and 128 were women. The length of the sugar-manufacturing season in Japan varied from 261 days in 1904–5 to 226 in 1908–9, to 298 in 1910–11, and to 294 in 1913–14, or an average of 279 for the decade.

The imports of sugar into Japan decreased from 273,650 tons in 1904 to 87,631 in 1911 and increased to 362,534 in 1913. The exports gradually increased from 16,349 tons in 1905 to 111,670 in 1913. The imports have been approximately double the production and the exports two-thirds of the production, except in 1913, when the exports considerably exceeded production.

FORMOSA.

CANE SUGAR.

The production of sugar in Formosa has increased 400 per cent during the period 1903–1914. The production was slightly less than 40,000 tons in 1903–4, which increased to 222,000 tons in 1914–15. The average production for the five years 1903–4 to 1907–8 was 65,881 tons, as compared with 193,120 tons for the five years 1910–11 to 1914–15, an increase of 193.1 per cent. The area used for cane in 1913 was 165,094 acres, from which was produced 350,885 tons of cane, an average of 6.13 tons per acre. The sugar obtained from this cane amounted to 79,368 tons, an average extraction of 10 per cent per weight of cane. The first modern sugar factory is said to have been erected in Formosa in 1902 by Americans. Prior to that date the manufacture of sugar was by the open-kettle process, and the cane was ground in wooden roller mills operated by buffaloes. The small mills have decreased in number, while the modern factories have increased from 1 in 1902 to 33 in 1912. The 33 factories have a crushing capacity of 24,000 tons of cane per day, and produce only raw sugar. As late as March, 1913, there was only one refinery in Formosa, and the sugar exported was refined in the country of destination. Most of the sugar was exported to Japan, where it was refined, part of which was retained for consumption.

STRAITS SETTLEMENTS.

CANE SUGAR.

The area used for sugar cane in the Straits Settlements increased from 9,825 acres in 1899 to 15,020 in 1902, but decreased to 2,934 acres

in 1912. Statistics of sugar production are not available, but the exports increased from 36,390 tons in 1899 to 60,274 in 1905, to 76,238 in 1912, and decreased to 65,172 in 1913. The imports of sugar for this 15-year period exceeded the exports and varied from 41,099 tons in 1899 to 111,083 in 1913. During the last 10 years the rubber industry has gradually taken the place of sugar manufacture.

FIJI ISLANDS.

CANE SUGAR.

In the Fiji Islands the area of sugar cane and the quantity of sugar produced during the last 20 years have increased more than 200 per cent. The area in 1893–94 was 15,759 acres; 10 years later it had increased to 33,304, and in another 10 years, or in 1913–14, the area was 48,208 acres, or three times the area in 1893–94. The annual area during the decade 1903–4 to 1912–13 was 42,850 acres, as against 21,196 for the preceding decade, an increase of 102.2 per cent. The output of sugar shows an even greater increase than the area. In 1893–94 the sugar produced amounted to 17,236 tons, which increased in 1903–4 to 52,011, and in 1913–14 to 110,441, or more than six times the quantity produced in 1903–4. The annual production of sugar for the decade ending with 1912–13 was 68,080 tons, as against 31,737 for the preceding decade, an increase of 114.5 per cent. The figures used for sugar production prior to 1903–4 are exports, but as a very small quantity of sugar is retained for home consumption the production figures, if available, would show very little change in the percentage.

AUSTRALIA.

CANE SUGAR.

The cane-sugar industry of Australia is of comparatively recent development. In 1870–71 the production was about 3,000 tons. In 1900–1901 it had increased to about 100,000 tons, and in 1910–11 the production was more than 250,000 tons. The area devoted to the growing of cane is a narrow strip along the eastern coast beginning with the three northern counties of New South Wales and extending almost to the extreme northern part of Queensland. About 1 per cent of the land under cultivation is devoted to the growing of cane, of which about 90 per cent is in Queensland. The total area under all crops in 1903–04 was slightly more than 9,000,000 acres, which increased gradually to more than 13,000,000 acres in 1912–13. The total area under sugar cane increased from 131,698 acres in 1903–4 to 155,567 in 1912–13. As the sugar cane requires about 18 months to mature, the total area under cane for any one year really includes cane for two successive harvest seasons. The planting season begins in February and ends in October, and the harvest season extends from June to the following January. The area of cane used for sugar during the period 1903–4 to 1912–13 varied from one-half to two-thirds

of the area under cane. The actual area of cane used was 65 per cent of the total area under cane. The cane is usually planted about once in four years. One planting produces one crop of plant cane and three crops of ratoon or stubble cane. The average annual yield of cane per acre was 18.55 tons for the 10 years 1903–4 to 1912–13, ranging from 22.36 tons in 1910–11 to 15.09 tons in 1912–13. The average yield for New South Wales was 25.57 tons, compared with 17.47 tons for Queensland. The total value of all farm crops in 1907–8 was $148,000,000, which increased to $223,000,000 in 1912–13. The value of the sugar cane was $8,393,000 and $4,353,000 for the same years. The sugar-cane crop yielded the farmer $54.17 per acre in 1907–8, but decreased gradually to less than one-half that amount, $24.84, in 1912–13.

The growers were paid for their cane in proportion to the sugar content, which varies considerably, thus causing a fluctuation in price of about $3 per ton, the lowest price being about $2 and the highest about $5. The average price received by the grower during the period 1907–8 to 1912–13 was slightly in excess of $3 per ton.

The number of sugar mills decreased from 59 in 1903–4 to 50 in 1912–13. These mills employed more than 4,500 people, of which 10 were women in 1910–11, which was increased to 12 the following year and to 13 in 1912–13. The sugar output of these mills has gradually increased and ranged from 125,058 tons in 1903–4 to 144,776 in 1912–13, or an annual average for the 10 years of 193,150 tons. The quantity of cane required to produce 1 ton of raw sugar varied from 8 tons in the northern part of Queensland to 10 tons in the southern part, or an average sugar extraction of 10.5 to 11.5 per cent of the weight of the cane. The quantity of sugar produced per ton of cane varied from 210 to 230 pounds. In addition to the sugar produced there was an annual production of more than 6,000,000 gallons of molasses.

The sugar industry of Australia has been encouraged by a Government bounty of 6 shillings per long ton ($1.30 per short ton) of cane or beets grown by white labor. The sugar produced by white labor exceeded that produced by colored labor for the first time in 1906–7. In 1902–3 the sugar produced by colored labor was 68 per cent of the total, which decreased to 5 per cent in 1912–13. The production of sugar is insufficient to supply the home demand. The imports have averaged 54,638 tons during the period 1903–1913, while the exports averaged 576 tons during the same period. The sugar consumed during the 10 years 1903–1912 amounted to 238,097 tons, or a per capita consumption of 112 96 pounds.

Data relating to sugar beets are available only for the years 1910–11 to 1912–13. The beets were mostly grown in Victoria, but a small area in Tasmania was devoted to this crop. The area for the

three years, respectively, was 472, 756, and 938 acres. The total yield was 6,871, 4,540, and 7,006 tons, and the average yield per acre was 14.56, 6.00, and 7.47 tons. The total farm value of the beet crop was from $20,000 to $30,000, or a value of $3.68 to $4.47 per ton. The value per acre was given as $49.49, $24.75, and $29.76, respectively, for each of the three years.

In July, 1902, the excise tariff act came into operation. A duty of £6 per long ton, or 1.3 cents per pound, was imposed on imported sugar. This act also provided for an excise tax on all Australian sugar used for home consumption. The tax amounted to £3 per long ton, or sixty-five one-hundredths of 1 cent per pound. Out of this tax a rebate or bounty of £2 per long ton, 0.43 cents per pound, or 86.9 cents per short ton of cane, was paid to the grower for cane produced by white labor. This bounty was made to the grower on the basis that it took 10 tons of cane to produce 1 ton of sugar. In December, 1905, the tax was increased to £4 per ton, 0.82 cents per pound, for domestic sugar consumed locally. The bounty also was raised to £3 per long ton of sugar, 0.65 cents per pound, or 6 shillings per ton, $1.30 per short ton of cane, yielding 10 per cent of commercial sugar. In July, 1913, the excise and bounty acts were repealed, the growers agreeing not to employ colored labor on the sugar plantations.

EGYPT.

CANE SUGAR.

The territory of Egypt used for the growing of sugar cane is in the valley of the Nile, and this crop is mostly an irrigated one. During the decade 1903–4 to 1912–13 the territory known as Upper Egypt contained 92.9 per cent of the area under cane, while only 7.1 per cent was in Lower Egypt. The total area under cultivation in Egypt during the above decade averaged 7,911,000 acres annually, of which 51,296 acres, or 0.6 per cent, was used for sugar cane. The area used for cane has decreased considerably during the last 10 years. The area under cane in 1903–4 was 69,470 acres, 40,027 in 1907–8, and 50,310 in 1912–13, or an average of 51,296 for the decade. The total yield of cane is not available, but the cane used for sugar decreased from 10.81 tons per acre in 1903–4 to 6.98 tons in 1907–8, and increased to 16.24 tons in 1912–13, or an average of 11.11 tons for the decade. The cane used for sugar decreased from 729,265 tons in 1903–4 to 279,388 in 1907–8, and increased to 816,952 in 1912–13, or an average of 569,779 for the decade. The production of sugar shows a decrease from 71,172 tons in 1903–4 to 28,154 in 1907–8, but increased to 83,135 in 1912–13, or an average of 56,514 for the decade. The sugar content of the cane varied from 12.92 per cent in 1903–4 to 12.88 per cent in 1912–13, the average for the

decade being 12.56 per cent. The percentage of sugar extraction per weight of cane varied from 9.8 per cent in 1903–4 to 10.2 in 1912–13, an average of 9.9 for the decade, a loss of approximately 3 per cent, part of which was in the molasses. The sugar extraction per ton of cane decreased from 215 pounds in 1903–4 to 191 in 1904–5, increased to 236 in 1909–10, decreased to 224 in 1912–13, and averaged 219 for the decade. The production of sugar per acre was 1,849 pounds in 1903–4, 1,406 in 1907–8, 3,305 in 1912–13, and averaged 2,203 for the decade. The exports of sugar during the last 10 years show a decrease, while the imports show an increase. The exports were 25,310 tons in 1904, 4,329 in 1908, 5,658 in 1913, and an average for the 10 years of 11,387 tons. The imports were 22,922 tons in 1904, 58,703 in 1908, 36,305 in 1913, and an average of 40,576 for the decade. The domestic production of sugar has not been quite equal to the home requirements, as the annual imports during the last 10 years were nearly 30,000 tons in excess of the exports. The exports for the decade 1904–1913 were 20.1 per cent of the production, as against 71.8 per cent for imports. The consumption of sugar increased from 68,784 tons in 1904 to 113,782 in 1913, an average of 85,703 for the decade, or an average per capita consumption of 15 pounds. The consumption of sugar for the decade was 51.6 per cent in excess of the production. The planting season for sugar cane is from February to May, and the harvest season is from October to December, the average length of the sugar-making season being usually less than 100 days.

NATAL.

CANE SUGAR.

The area used for the growing of sugar cane in Natal is in the lowlands along the coast and increased from 13,345 acres in 1893–94 to 33,282 in 1903–4 and to 64,938 in 1911–12. The production of sugar increased from 17,699 tons in 1893–94 to 41,062 in 1901–2, to 86,790 in 1909–10, and to 96,880 in 1913–14.

In 1909–10 the total area under cultivation was 451,638 acres, of which 46,567 acres, or 10.3 per cent, was in sugar cane. The area of cane cut for sugar that year was 24,512 acres, or 52.6 per cent of the area under cane. The yield of sugar per acre was 2.9 tons. There were 42 sugar factories in operation, of which 39 were operated by steam power, one by oil engine, and 2 by water power. The greater portion of the sugar produced in Natal is consumed locally. The exports were small and decreased from about 35 per cent of the production in 1899 to 2 per cent in 1913.

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